38 L 734 cop. 2

RECEIVED FEB 25 1937

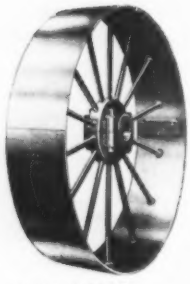
FOOD MANUFACTURE

PUBLISHERS: LEONARD HILL LIMITED, 17, STRATFORD PLACE, W.1 FEBRUARY, 1937

GENERAL VIEW OF MESSRS. J. LYONS & CO. LTD. ENGINE ROOM

CROFTS

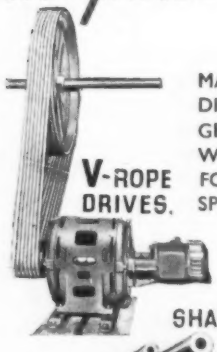
1887
7 EMPLOYEES



PULLEYS

1937
OVER 1200 EMPLOYEES

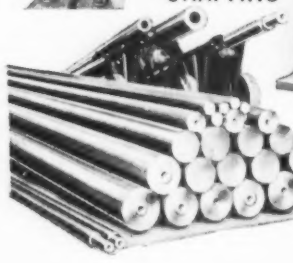
50 YEARS
SERVICE TO INDUSTRY
in power transmission equipment



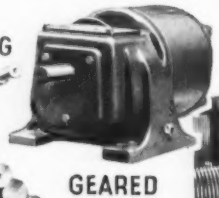
V-ROPE DRIVES.

MAKERS OF BELT, ROPE, V-ROPE, CHAIN AND GEAR DRIVES, V-ROPE DRIVING V-ROPE, VARIABLE SPEED DRIVING (CROFTS PATENT) VARIABLE SPEED GEARS, FLEXIBLE COUPLINGS, MACHINE CUT GEARS—SPURS, BEVELS, WORMS, DOUBLE HELICALS, ETC., REDUCING AND INCREASING GEARS FOR ALL POWERS AND SPEEDS, "ENISPEED" GEARED MOTORS—WORM, SPUR, HELICAL, ETC., IRON, STEEL AND NON-FERROUS CASTINGS.

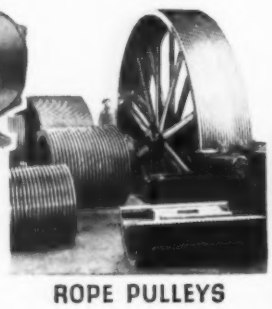
Fully informative Catalogues of all products on request.



SHAFTING

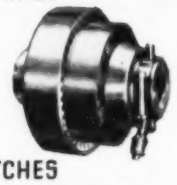


GEARED MOTORS

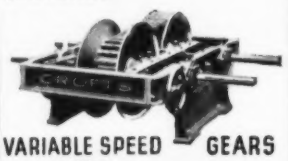


ROPE PULLEYS

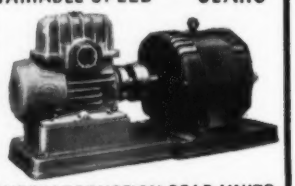
BEARINGS



CLUTCHES



VARIABLE SPEED GEARS



WORM REDUCTION GEAR UNITS

DOUBLE HELICAL GEARS

Crofts (ENGINEERS) LTD.,
THORNBURY, BRADFORD, ENG.

A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF: Chocolate, Confectionery, Biscuits, Bread, Cake; Jam; Glacé, Candied and Preserved Fruits; Fruit Juices and Cordials; Jellies, Honey and Lemon Curd; Cheese and Milk Products, Infant, Breakfast and Invalid Foods; Ice Cream; Canned Foods; Meat, Fish and Vegetable Products; Soups, Pickles, Sauces, Pastes and Extracts, and all edible commodities involving a process of manufacture

FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

Volume . . . XII
Number . . . 2

FEBRUARY . . . 1937

Packaging Number

SUBSCRIPTION

Single Copies - 1/-
Annual Subscription
12 Issues - - 10/-
Foreign - - 12/6

Published on the first day of the Month
by
LEONARD HILL LIMITED
17, Stratford Place, London, W.1
Telephone: Mayfair 7383
(Private Branch Exchange).

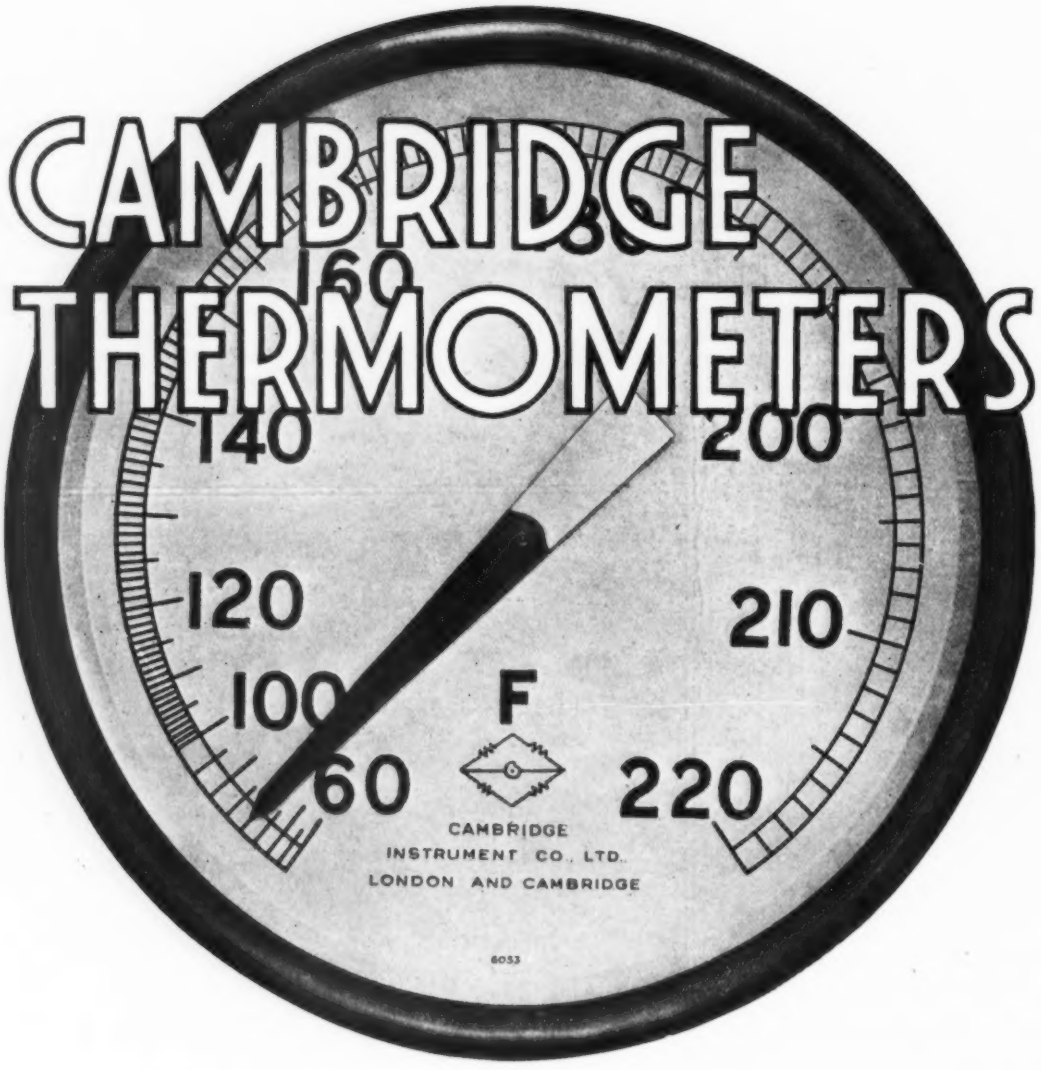
Managing Editor:
G. W. Lacey, B.Sc., A.I.C.

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

CONTENTS

	PAGE
Editor's Comments	37
Wrapping Materials for Fatty Foods *by W. L. Davies, Ph.D., D.Sc., F.I.C.*	41
Package Cavalcade	44
Cereal Chemistry in 1936. Part II. *by T. H. Fairbrother, M.Sc., F.I.C.*	49
Book Reviews	51
Novel Packages of 1936	52
British Industries Fair, 1937	54
New Laboratory for Food Research	56
Industrial News	57
Examination of Canned Salmon	61
Flavour and Creaming Power of Milk *by J. C. Marquardt*	62
Information and Advice	68
Recent Patents	70
Latest Trade Marks	71
New Companies	72

CAMBRIDGE THERMOMETERS



JAM BOILING
SUGAR BOILING
FRUIT DRYING
VEGETABLE AND MEAT CANNING
STERILISING RETORTS AND AUTOCLAVES
EXHAUSTING
COOKING PANS
LACQUERING OVENS FOR CANS
BREWING

DOUGH TEMPERATURES
BAKE OVEN TEMPERATURES
MILK PASTEURISING
MILK BOTTLE WASHING
CREAM STERILISING
CONDENSED MILK TEMPERATURES
CHEESE MANUFACTURE
FISH AND POTATO FRYING
FOOD PRESERVATION
COLD STORAGE

Etc., Etc.

SOME APPLICATIONS IN THE FOOD INDUSTRY

Many valuable facts regarding the use of instruments in the manufacture of food are given in our 32-page

LIST 902-Z

May we send you a copy?

CAMBRIDGE INSTRUMENT CO. LTD. 45 GROSVENOR PLACE. LONDON. S.W.1

FOOD MANUFACTURE

Vol. XII, No. 2 February, 1937

The P.R.S. and Food Research

THE PRESIDENT of the Royal Society, that very charming and distinguished scientist, Sir William Bragg, speaking at the inauguration of the new extension of the laboratories of the Confectionery and Food Manufacturers' Research Associations at Holloway, London, on January 19, put forward an ideal for the food industry about which we have written in these columns on one or two occasions during the past year. Referring to the value to the State of the quality of the food we eat, Sir William said: "With the rise in the study and knowledge of nutrition we must regard this as an ideal at which to aim." He then went on to say that people must learn to distinguish the good from the bad, and that the general public must be educated to realise the value of research. "Then", he said, "the time will come when attachment to a research organisation will be a hall mark of quality." There can be no doubt in the minds of anyone engaged in industry to-day as to the value of research, and in the food industry in particular it is being directed to a purpose which can only bring ever-increasing benefit to the people and collectively to the State. To quote Sir William again: "Great industries have come from the results of research. So research must go on. The impulse to research is spreading throughout the world." Sir William congratulated the Association on the work that had already been done at the research station since it was started fifteen years ago, and attributed the success to Mr. Macara, director of the station, and his staff, and to the effective backing given by the councils of the two Associations. It is interesting to note that the total amount of expenditure on research at this station is £160,000, of which the Government has contributed £50,000 and the trade the remainder. This must be a small sum by comparison with the turnover of the trade in those years. The new laboratory is a valuable acquisition. It is to be devoted to work for the Food Manufacturers' Research Association on problems affecting meat and fish products, for which it has been very well equipped. A note on the new laboratory and some pictures of it will be found on page 56.

Extension of Honey Research

The Agricultural Research Council has recently made a substantial grant to the Rothamsted Experimental Station to permit the beekeeping researches to be expanded to include the investigation of problems connected with honey itself. Dr. C. R. Marshall, of Birmingham, has been appointed to carry out the work, and has already taken up his duties. The research work will be of a physico-chemical nature related to the practical problems of processing and quality, such as granulation, rate of granulation, texture of grain, frosting and fermentation. Dr. Marshall has previously been working on chemical problems connected with the structure of mucilages. The Government is bearing the whole cost of this new work.

Food Poisoning

Sir Arthur Macnalty's Report* for the year 1935 has recently been published and it contains interesting details of food poisoning during the year. Altogether 137 outbreaks of suspected food poisoning were reported to the Ministry of Health. Many different sorts of food were concerned, but the majority fell into three classes—canned fish, potted meat or fish, and pickled or pressed beef. Only one instance was met with of the variety of food poisoning due to a staphylococcal infection of starchy creams which is so prevalent in America. In this 34 persons who had partaken of a custard made with a proprietary custard powder and milk suffered from violent vomiting and diarrhœa. There were 53 outbreaks of Salmonella infection, the majority being cases of gastro-enteritis, in which the source of infection was not discovered. Duck eggs were suspected in ten cases, but it was impossible to trace the ducks.

* Annual Report of the Chief Medical Officer of the Ministry of Health for the year 1935.

The eggs were mainly of foreign origin. The biggest outbreak attributed to duck eggs was in Preston, when at least 250 people were affected. The medium of infection was, apparently, ice-cream. Food may be infected with Salmonella in three ways—animals, such as ducks or pigs, suffering from Salmonellosis may be used for food, or they may excrete the specific bacteria and contaminate food with which they come in contact; in this case rats and mice are the chief offenders. Finally, human beings infected from one of these animal sources may contaminate food by handling.

Botulism

The Report refers to the considerable amount of research done by the canning industry, particularly in the United States, towards the discovery of the conditions of heating required for different articles in order that they may be rendered safe. This information should be of great value to firms in this country who are engaged in the preservation of food by heat in air-tight containers. All manufacturers who are engaged in this type of work should study the information carefully and equip themselves with appliances which are capable of performing an adequate sterilisation. This aspect cannot be overstressed, and we feel that there are still some firms that may not devote sufficient attention to this aspect of their trade. The practice known as "home canning" of vegetables is particularly dangerous because those who do "home canning" as a rule are not aware of the dangers involved and of the need for adequate sterilisation. Even if they have this knowledge they have not suitable equipment. An analysis of the outbreaks of botulism in the United States has shown that outbreaks attributable to the consumption of home canned products are much more numerous than those attributable to factory canned products. Indeed, the practice is so widespread in that country that the Agricultural Experiment Station of Washington State College has recently issued one of its Bulletins (No. 337) dealing with Home Canning Costs. The Bulletins are "sent free to citizens of the State on application of the Director".

Metallic Poisons

As one would expect, a section of the Report is devoted to metallic contamination of food, and it is stated that normally aluminium is very slightly dissolved or corroded by food, whether solid or liquid, but in certain cases, as for instance when carbonate of soda is added in the cooking of vegetables, when salt or organic acids, such as citric acid, are present together, or when alkaline water is allowed to simmer for long periods in an aluminium kettle, corrosion may be increased. As to the effect of aluminium on the body, a great deal of work has been done, but there does not appear to be any positive evidence that aluminium in the amounts in which it is likely to be consumed as a result of using aluminium utensils has any deleterious effect on the normal consumer. Imported tomatoes were found to contain arsenic, presumably due to spraying the tomatoes with an arsenical preparation during growth. Food growers should realise the great danger of contaminating their products by arsenical sprays. Some time ago lead was discovered in curry powder. It was then found that the turmeric root used contained lead. Investigations are now being made to discover how the lead got into the turmeric. An unusual case of metallic poisoning was due to the contamination of food with cadmium as a result of eating food prepared on an electric cooker. The cooker was plated with cadmium, and on being heated this became oxidised and flaked off. There seem to be dangers lurking in all sorts of unsuspected places.

A New Essay Upon Tea

The subject has been brought up to date by the Empire Tea Market Expansion Board in a booklet addressed to the medical profession, entitled "A New Essay Upon Tea", which is appropriately dedicated to Dr. Lettson. In it is a history of tea, and hints are given to aid the choosing and serving of what is best. It tells us that the tannin of tea—which anti-tea drinkers allege tans the stomach of the addict—is not the tannin of the pharmacopœia, and in any case it contains less of it than certain other beverages. Some interesting experiments are described, including an investigation of the action of the different components of teas on the stomach juices *in vitro* and of the effects on a number of healthy young men and women. It was discovered that hot water can be drunk without discomfort, but when caffeine alone, or B.P. tannin alone, was added, discomfort and sickness ensued. Strange to relate, however, when both substances were added no discomfort followed. It was also found that the addition of milk and sugar prevented any feeling of discomfort even if the tea had been infused for a long time, or, in common parlance, "stewed". The general conclusion from the investigation is that tea taken in the ordinary English fashion, with milk, does not hinder digestion. If it is taken without milk it must be *very high-class* tea. The longer the tea has been infused the

greater is the amount of milk required. Of course, it is the Expansion Board's job to sell tea, and the conclusions arrived at may be somewhat biassed, so that, in spite of the good case that has been made for tea, discussion on its virtue and efficacy may well go on for centuries yet, after which there still may be some who will murmur " Beer is best ".

That Nice Cup of Tea

After beer, tea may be regarded as our national beverage. It has rapidly insinuated itself into our daily habits, and in a few centuries has gained almost as much popularity as the beer which blended so well with the roast beef of England in the days of Good Queen Bess. True it is that its consumption is greater among the fair sex, but we know many males who would not like to be deprived of their fragrant beverage. As with most things we eat or drink, the effect of tea on health has been a subject of controversy ever since its introduction just after the Restoration. Indeed, about 1770 a medical thesis for an M.D. degree states that " the accounts which have been given of the virtues and efficacy of tea are in general so contradictory and void of true medical observation that it seems no improper subject for a candid discussion ". The writer of this thesis had some difficulty in separating tea from vegetables and said : " It will appear that our attachment to tea is not merely from its being costly or fashionable, but from its superiority in taste and effects to most other vegetables." Even to-day, when its consumption is far greater than it was when Lettson wrote the thesis to which we have just referred, tea still comes under the watchful eye of science, and last year a discussion, opened by Dr. G. Roche-Lynch, took place between the Society of Public Analysts and the Food Group of the Society of Chemical Industry on tea and coffee, but as far as we can see the result was only a restatement of Lettson's views in modern terms.

New Can Lacquering Process

A process for lacquering cans directly instead of applying the lacquer to the tin-plate before fabricating the can is the subject of British Patent No. 455,810, with which is associated the names of Crosse and Blackwell, Ltd., Dr. W. Clayton (chief chemist), and others (see *Food Industries Weekly*, 1937, January 1, p. 8, and January 15, p. 7). The new method consists in coating the internal surface of the can with lacquer by electrodeposition from an emulsion of the oil-in-water type, the lacquer being stoved afterwards according to the usual practice. Thus any deformation or rupture of the lacquer layer due to mechanical fabrication of the can is eliminated. The container itself forms one electrode in the process and the circuit is completed by an electrode immersed in the lacquer emulsion. Anodic deposition of this nature has, of course, been well known for some time, coatings of rubber having been deposited successfully over a variety of intricate surfaces. Containers in the lacquering process are passed continuously through the electrodeposition machine and, after filling with the lacquer emulsion, deposition occupies about five to ten seconds. The containers are then emptied, washed and stoved. A suitable emulsion is described in the patent, ammonia being used as the emulsion stabiliser. Cans have to be clean and free from grease. An initial current of 2 amps. gives an effective deposit in the time allowed. Faults in the tin coating do not impair the continuity of the lacquer film. The behaviour of the tin-plate of a can lacquered by electrodeposition is apparently quite remarkable. For example, much better protection is afforded against sulphur staining from meat in cans. According to the authors of the process, the success already achieved indicates that it may be a solution to one of the major problems of the canning industry. We shall be able to give a full description of the equipment necessary for carrying out the process and of the results of experimental work in the spring Canning Number of FOOD MANUFACTURE published on April 1 next.

Wheat Germ Oil

As Mr. A. L. Bacharach said in a contribution in the *Manufacturing Chemist* (December, 1936, p. 395) on the use in medicine and the standardisation of vitamin E, progress during the past few years in establishing the chemical constitution of certain vitamins has been little short of miraculous. Vitamin E, which is the fat soluble, anti-sterility vitamin, has not yet yielded up its secret, but, as Mr. Bacharach points out, the statement, recurring from time to time, that there is no evidence for its use in human beings is incorrect (see, for example, FOOD MANUFACTURE, October, 1936, p. 348). Two papers are cited by the author in which a number of cases are reported of human abortion, not due to clearly ascertainable causes, having been cured by the administration of wheat germ oil, or extracts from the oil, a potent source of vitamin E. Successful results were achieved from wheat germ oil therapy in 95 per cent. of the cases of habitual and threatened abortion, but, as previously found, there was no effect on simple infertility. The standardisation of vitamin E thus becomes all the more

important, and the problem which is one of the most difficult to solve is discussed at length. Further investigation is needed if some chemical or physical property of vitamin E concentrates that will indicate stability is to be worked out.

Eggs and Cake-making

The United States Department of Agriculture is seriously studying the quality of eggs in relation to their uses, and from the Department comes a further report on "Cake-making quality of Eggs as related to some factors in Egg Production". (Florence B. King, Elizabeth Pullen Whiteman, and W. G. Rose, *Cereal Chemistry*, 1936, xiii., 6, 703.) The earlier part of the investigation described the methods and apparatus used in studying the leavening property of eggs measured quantitatively by a determination of several physical properties of sponge cakes—weight, volume, tensile strength, and compressibility. The specific gravity and *p*H of the cake batter were determined, and various tests, such as CO_2 content of yolk and white, were made on representative samples of eggs. The present investigation was planned to show the effect, if any, of the diet of the hen, and of the season of the year on the laying cycle of the hen, on the properties of the eggs, and on cakes in which they were used. Eggs were taken from groups of hens on five different rations. Physical measurements on sponge cakes indicated that the diet did not affect the properties of the eggs or the quality of the cakes made from them. No progressive change was found in the properties of the eggs or the quality of the cakes over the period of the laying cycle of the hen, or the seasons of the year. There was also no apparent relationship between the physical and chemical properties of the eggs studied and the quality values of the cakes. But a relationship between the specific volume, elasticity and compressibility of the sponge cakes and between the *p*H and specific gravity of the batter from which the cakes were made was found. One would have expected this, though perhaps not that the investigators would have found it necessary to take one into the realm of mathematical expression of the properties of elastic bodies. The negative conclusions, however, clear up possibilities that will have entered the minds of several of us.

Making Britain Cheese Conscious

Last month we referred in these columns to the Wine and Food Society, which is doing good work in making English folk more appreciative of fine flavours in both food and drink. The society has recently published a useful little brochure on cheeses, by its president, Mr. André L. Simon, entitled "A Catechism Concerning Cheeses". English cheeses are dealt with in detail, foreign cheeses less fully, though in the section dealing with the latter we expect most English readers will find a good deal of information that is new to them. Mr. Simon refers to Wensleydale as the best of all English cheeses; and it is matter for regret that this admirable cheese, of which there are two distinct varieties, is not made in larger amount. It is not too easy to obtain in London. Mr. Ernest Oldmeadow contributes an interesting and suggestive Introduction, in which he compares cheese with wine. Both "represent man's effort to transmute the Perishable into the Durable", milk in the one case, grape juice in the other, each of which undergoes

> "a change
> Into something rich and strange".

He is of the opinion that cheesemakers ought to label their produce along the same lines that German wines are labelled, giving the name of the maker, his locality, and the date. He strongly deprecates the tendency of colonial cheesemakers to be content with the production of cheap imitations of English cheeses. "They ought", he writes, "to widen their experiments in order to give us their very own kinds of cheese, instead of imitating crudely the achievement of another clime."

Chocolate and Doctors

We learn that French chocolate manufacturers are becoming very much annoyed about the fact that French doctors are more and more advising patients against eating chocolate. They say that they do not understand the logic of this as the sugar content is good for anæmia, the fats help to fight tuberculosis, the vitamins are a protection against rickets, and the magnesian salts a preventive of cancer. This has been answered in medical circles by the charge that, while all of these facts may be true, they can only be true for good quality chocolate. Manufacturers of the cheap varieties have in the past few years taken to replacing the cocoa butter in the chocolate by cocoanut and other oils, which enables them to make an extra profit. These, the doctors argue, are conducive to stomach troubles. Doctors say that when manufacturers stop this practice they will again feel themselves able to recommend chocolate to their patients.

WRAPPING MATERIALS for FATTY FOODS

By W. L. Davies, Ph.D., D.Sc., F.I.C.
(National Institute for Research in Dairying, Shinfield, near Reading)

FOODS ARE wrapped primarily for the purpose of preventing contamination from outside sources, to prevent loss of weight by moisture-loss, to facilitate methods of retail sale, and to prevent short weight and adulteration. An appealing wrapper is also considered a selling asset, while printed material on the wrappers supply not only directions for use but also an opportunity for advertisement. With opaque wrappers for dry foods, a container for the food and the prevention of moisture-loss only are of primary importance, but, with transparent wrappers and with contact wrappers of fatty foods (butter, margarine, etc.), complications enter in that light passing through the former may cause deterioration of fat or the physical and chemical nature of the latter may influence the storage properties of the fatty food. It is with these phenomena that this article deals.

With the extensive use of transparent wrapping materials the influence of light upon foodstuffs wrapped so that they can be seen or displayed has become a prominent cause of deterioration, especially in the case of fatty foods. Work has therefore been carried out at the Dairy Research Institute to determine the most suitable colours, thicknesses, etc., of wrappers for fatty foods, the latest results of which are described by Dr. Davies in this paper. From the scientific conclusions valuable practical recommendations are made.—ED.

Storage Properties of Fats

The fats of various foods differ so much in composition, in condition after treatment during processing before or after incorporation into the food, and in their physical state in the food, that it is imperative to consider the fundamental conditions of fat storage. The effects of the wrapping material on the fat must be considered as being superimposed on the conditions of the food fat itself which affect the storage qualities. The fact that a difference in behaviour of fats in the same wrapping material occurs is therefore not surprising. Cooked fats such as occur in biscuits and potato chips will behave differently under the influence of sunlight passing through transparent paper wrappings than butter wrapped in regenerated transparent cellulose.

The factors which influence the storage qualities of a fat are as follows: (*a*) *Hastening deterioration*—high acid value of fat, fine degree of dispersion, presence of traces of heavy metals (copper, iron, manganese, etc.), and absence of natural or added antioxidants; (*b*) ***retarding deterioration***—low acid value, compactness of condition, thus preventing the diffusion of air in contact with a large area of fat and the presence of natural or added antioxidants (carotene, lecithin, and maleic acid). Before a fat shows signs of oxidative deterioration it must pass through a period of induction of oxygen uptake. It is the length of this period of induction during which a fat is in its sweet condition which differs for various fats, and it is the factors (*a*) and (*b*) above which shorten or lengthen this period respectively. Our consideration, therefore, is to see how transparent and opaque wrappers contribute to the above factors. Most of the factors in (*a*) have the property of activating the oxygen diffusing into the food and thus accelerating its action on the fat; the factors in (*b*) tend either to retard the activation of oxygen or use up active oxygen before it attacks the fat. Light of a chemically active nature also activates oxygen, and therefore strong sunlight or ultra-violet light belongs to the factors (*a*) above.

Opaque Contact Wrappers

This type of wrapper is usually of cellulosic material—vegetable parchment, greaseproof paper, or regenerated transparent cellulose. The microbiological side of food contamination requires that such wrappers should be free from mould spores and also free from water-soluble material which possibly would serve as a nutrient for mould growth in the food. The hygienic manufacture and storage of these wrappers is therefore necessary, and the absence of water-soluble material, sugars, and dextrins from vegetable parchment and transparent cellulose makes them ideal wrappers for butter and other fats. From the standpoint of the chemical deterioration of the wrapped fat, no material likely to hasten autoxidative changes in the fat must be dissolved out of the wrapper.

All cellulosic materials contain traces of copper and iron as natural constituents in the form of resinates. (Wood cellulose pulp contains 12-20 p.p.m. of copper and 30-50 p.p.m. of iron.) Additional traces may be added from the beating machines and the water used in their manufacture. If the wrapping material is treated with a loader or softener the amount of these metals is greatly increased. For contact wrappers it is therefore advisable to keep to pure paper or hard-neutral vegetable parchment. Investigations have proved that although the amount of heavy metals in cellulosic wrappers is comparatively high, no solution of these heavy metal salts occurs and none finds its way into the wrapped fat. A small fraction of the metals can dissolve on prolonged extraction with mineral acids, but fatty acids, such as oleic acid, have no solvent effect.

Moisture Losses

All cellulosic wrappers except varnished transparent cellulose are porous and surface-loss of moisture from a wet food in direct contact with the wrapper is bound to occur, even if only by diffusion of moisture along the cellulose fibres. The moisture content of the layers in direct contact with the wrapper is thus lower than that of the body of the fatty food. In butter, moisture has a profound effect on the colour. Loss of moisture from the outer layer yields a deeper yellow tint, which is easily observed on cutting through the sample. This is known as a "primrose" tint and is the source of trouble when butter is blended, as the outer layer renders the blend non-homogeneous. Removal of moisture also concentrates the acidity in the remaining water of the outer layer, and with the full effect of diffusing oxygen, the wrapped fat may soon develop an off-flavour. This, in butter, is known as "toppiness," and is undoubtedly a form of fat oxidation due to better conditions for autoxidation in the desiccated layer.

If, again, the nature of the cellulosic wrapper is such as to preclude the fibres being covered with fat due to creeping from the fatty surface, the state of the fat surface is further guarded from deterioration. This is met with in the various degrees of "greaseproofness" of wrappers. Hard-neutral vegetable parchment has this property, but greaseproof paper and transparent paper are somewhat inferior. Again, different wrapped fats creep easier than others; the acid value, or the free oleic acid content, is closely linked up with greaseproofness.

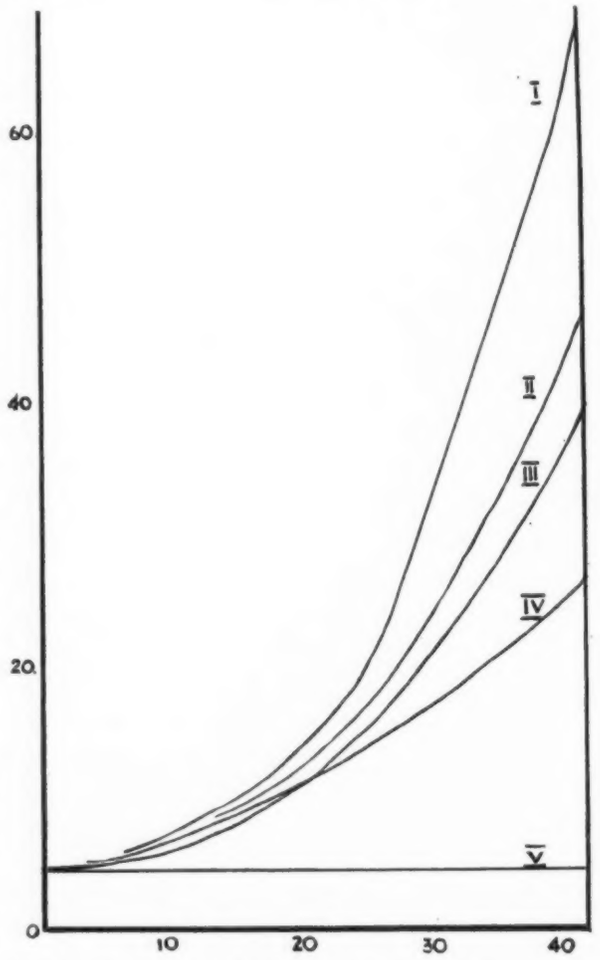
Transparent Wrappers

The chemical action of light on various constituents of foods and other materials is well known. The packing of pure chemicals in brown bottles is used as a precaution for this reason. Various dairy materials—rennet, starters, etc.—are also supplied in brown glass or stoneware containers. Milk develops a cardboard taint, which is evidence of incipient fat deterioration, when exposed to strong sunlight or to ultra-violet light. Irradiation of milk to increase the vitamin D content must be done with a short (3-10 seconds) intense exposure. Vitamin C is destroyed rapidly in milk on exposure to chemically active rays. Meat and bacon fat will show oxidative rancidity after exposure to light. The delicate aroma and, in some cases, the colour, of fruit juices are destroyed by exposure to sunlight.

In investigations on the effect of light alone on fats two observations of importance have been recorded: (*a*) If autoxidation is initiated by a short exposure to light, subsequent storage in the dark does not seriously delay the development of oxidative rancidity and tallowy taint; (*b*) light not only initiates peroxide formation, which is the first step in the development of tallowiness, but also hastens the formation of the substances responsible for the tallowy taint of fat. Light affects fat therefore in the same way as other peroxidative catalysts, speeding up possibly the whole chain of reactions necessary for the development of tallowiness. The effect of light again is additional to the effect of the pro-oxidative catalysts already present in the fatty food.

Characteristics of Light

The important factors in fat storage during or after exposure to light are (*a*) the intensity of the light and (*b*) its wavelength. It has always been realised that,



Vertical axis: Ml. $\frac{N}{500}$ thiosulphate per gram. *Horizontal axis:* Days storage in the dark.

Diagram illustrating rate of fat deterioration when exposed on surfaces of various materials: I, Cotton wool; II, Glass wool; III, Hard neutral vegetable parchment; IV, Wood cellulose pulp; V, Control fat.

provided the proper colour of transparent wrapper is used, no harm can come to the fat. This has been arrived at after considerable investigation. The matter of intensity of light is important, but no reliable estimation is possible under practical conditions. There is, however, no doubt that strong sunlight from a clear sky is the most potent source of actinic light. The measurement of wavelength is easier and coloured transparent wrappers of various tints can be defined accurately either by colour standards or the logarithm of the number of thicknesses necessary to absorb all wavelengths of a standard light completely.

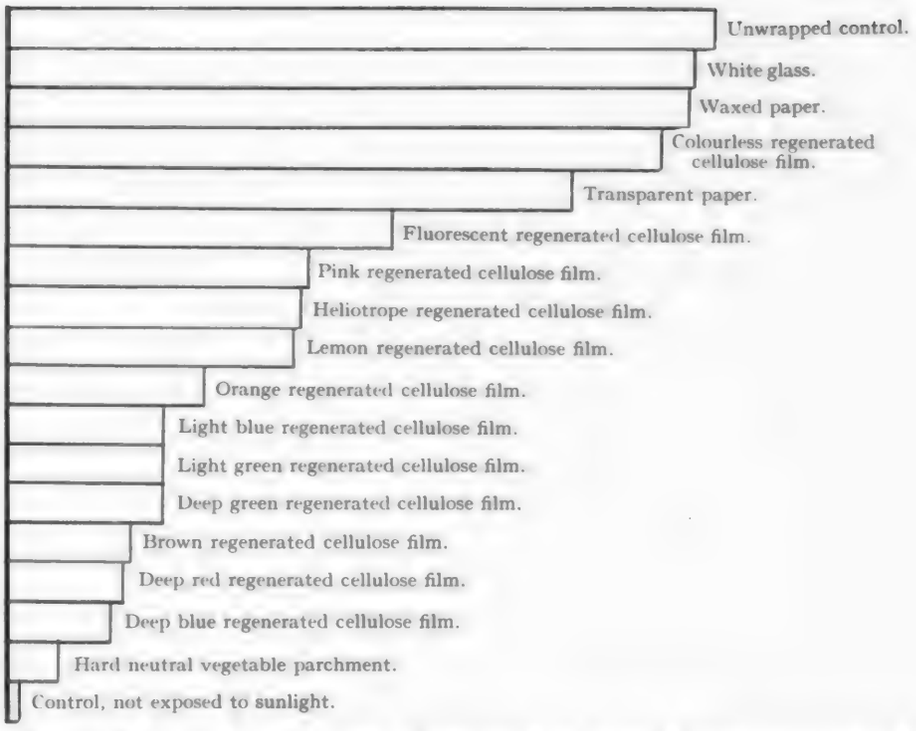


Diagram illustrating the relative degrees of deterioration of the fat of biscuit meal wrapped in transparent and other wrappers. Times of exposure of wrapped meal to direct sunlight = 8 hours. Period of subsequent storage = 30 days.

Fatty foodstuffs are often wrapped in coloured transparent wrappers for appeal and display and are often exhibited in a strong light. Taints can develop from such treatment. The problem consists of defining the type and depth of colour necessary to avoid fat tainting. It has been found that wavelengths above 4,800$\mu\mu$ have no effect on fat. This corresponds to the colours green, yellow, orange, and red of the solar spectrum. The other visible colours of the spectrum and ultra-violet light are chemically active as far as fat oxidation is concerned. If the "rancidity retardation ratios" of various coloured transparent wrappers are determined by dividing the time taken for rancidity to develop in a food wrapped in any coloured transparent cellulose by that taken for the taint to develop in a food wrapped in colourless material, a better practical measure is obtained of the protective effect of any colour. Using potato chips, for example, it has been found that films from green to red show a ratio of 24-28 and blue films 8-20 respectively.

To combine fat protection and transparency, an old gold film (Sylphrap R.R. Old Gold Film) allowing light of 5,000-6,000$\mu\mu$ to pass has been found practical. Fluorescent cellulose films have no protective action on fat; indeed, there is some indication that they enhance the harmful action of light.

Under practical conditions, however, it has also been found that, for fat protection, it is the depth of the colour which is more important than the colour itself. Thus a deep violet film has been found quite as protective as a light green film, and a dark blue better than light orange or yellow. It appears that the quality of the light falling on the wrapped article and the length of time of exposure are factors which have also to be taken into account.

Very little, if any, actinic light passes through opaque wrappers such as vegetable parchment and greaseproof paper. The transparency of glass, however, is marked and no protection of the fat is given. Light falling on waxed paper causes volatile autoxidative products of the wax to enter the food and initiate autoxidation. The practice of impregnating opaque wrappers with coloured extracts so as to absorb all actinic light appears to be unnecessary, although treatment of transparent cellulose in the same way would be beneficial.

In all cases where regenerated cellulose film is mentioned "Cellophane" was actually used.

SERVICE of SCIENCE to INDUSTRY

"THE Service of Science to Industry" was the subject of the Jubilee Memorial Lecture given by Dr. J. T. Dunn, F.I.C., at the meeting of the Food Group of the Society of Chemical Industry at the London School of Hygiene and Tropical Medicine, London, W.C. 1, on January 6.

Dr. Dunn dealt with the attitude of industry to science, effects of the war, Government and other facilities for research in industry, industrial and fundamental or purely scientific research, and the duty and attitude of industry to chemical research work.

Speaking from the chair after Dr. Dunn had delivered his address, Dr. Lampitt said that the statement that scientists were more welcome in some foreign countries than in our own was true to a point. Our basic industries had not realised what science could do for them.

PACKAGE CAVALCADE

A Review of the constructional progress made in food packaging during the past year

The Valve End Cheese Can, showing also the crimped-on key.

THE PACKAGING achievements of 1936 mark the year as outstanding in constructional development. Evolutionary to a degree, it would be more correct to describe the advance made as an organised development, rather than the result of circumstance and speculative effort, brought about by close collaboration between package manufacturer and food packer. The extent to which this appreciation of each other's technical difficulties has influenced the solution of many problems, the evolution of packaging methods, and the production of better packages is clearly demonstrated in the fruits thereof.

For instance, canned beer, perhaps the year's most sensational development, to which reference was made in this number of FOOD MANUFACTURE last year, could never have become an accomplished fact without the thorough investigation of filling and capping methods which preceded the production of a can to be handled on existing machinery. Canned cheese* would have been impossible without the solution of the curing problem that had hitherto precluded the canning of this product. "Air conditioned" packs would have been useless without the development of equipment for cold vacuum packing. And so on.

These examples show that the form of progress evident in the type of food containers produced is the result of a constructive effort to produce containers for given products, rather than finding products to fit the container. Similarly, modifications in materials to meet present-day requirements have played an important part in the year's progress. Influenced by its use as a table container the quality of glass has improved. Containers tend to become thinner, although its thickness is naturally dependent upon the use and is governed to some extent by the closure, since modern methods of sealing glass containers have played a very important part in the evolution of glass packaging. Whereas in former days slight variation in the dimensions of the individual container would not affect the fitting of the parchment jam cover, the modern metal and moulded plastic closure is produced with such precision that its counterpart must be absolutely accurate.

Fear of odour contamination, the chief disadvantage

* "The Packing of Natural Cheese in Cans." *Food Manufacture*, 1936, xi., 4, 128.

New aluminium foil bag lined with greaseproof or waxed paper, and the new pack for Sunsweet tenderised prunes which favours aluminium foil as the outside wrapper.

Aluminium foil-lined boxboard in cartons and boxes of various shapes and sizes. The large outer container for wafer biscuits is said to revolutionise the whole system of wafer biscuit delivery.

The beer and mineral water can, which was perhaps the most sensational packaging development of 1936.

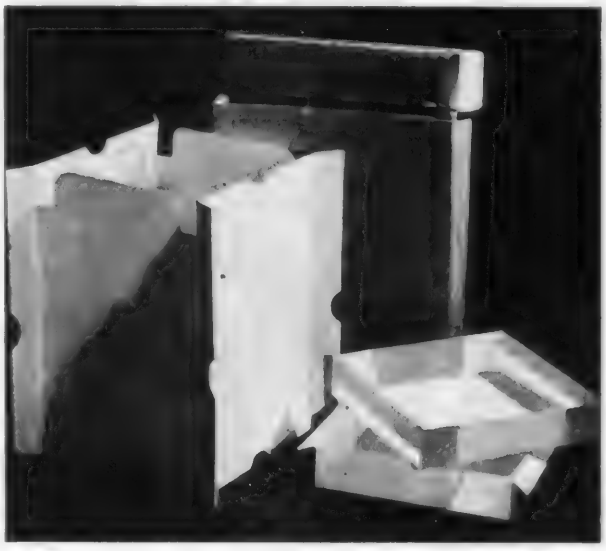
This type of rectangular composite container has been developed for food but is not yet used by any food manufacturer.

of moulded material for food packaging, has been removed by a special manufacturing process. Tea is now marketed in a moulded container, and experiments with biscuits, cereals, etc., have established that the treated material is also suitable for these products.

Progress in the transparent foil field has been mainly achieved in printing and application. An outstanding development was the introduction of a label for use on glass, metal, and similar material, producing the effect of copy printed directly on to the container.

The heavy pulpboard formerly used for cartons has been replaced by a lighter lined board, which, while being equally suitable for the purpose, has the advantage that it will not crack. Literally scores of types of cartons have been patented, but except for the waxboard carton evolved to contain dry ice it is not possible to cite individual improvements. Pouring, measuring, and dispensing devices have been incorporated in carton construction; and the introduction of cheaper accessory units, particularly in regard to decorative caps, has lightened package costs.

Whilst there has been a general trend towards structural improvements in all containers irrespective of the material in which they are manufactured, the production achievements which have influenced packaging and most markedly contributed to its progress during the year under review have for the most part been constructed in metal. It is to be hoped that equally arresting developments will be apparent in other materials during the course of the current year. The following descriptive remarks are confined to the developments which, in influencing the packaging or repackaging of individual products, have made packaging history, and to those which stand upon the threshold of fulfilment in 1937.



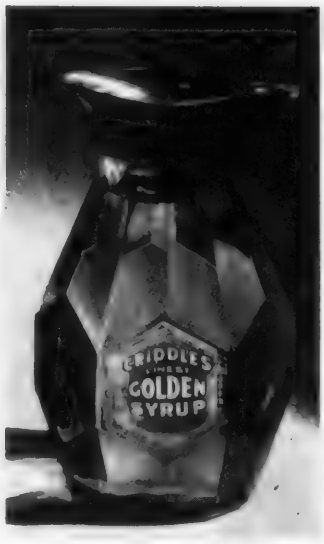
Waxboard carton for dry ice (above), showing the cardboard outer container in the background, the inner container for ice-cream and the smaller container for dry ice. Three attractive metal containers (below) illustrating three distinct methods of treatment—enamelled, etched and printed.

METAL CONTAINERS

Canned Beer

Following considerable experiment with linings during the latter part of 1935 the beer can was introduced into this country early in 1936, and has quite definitely estab-

Two foil-labelled bottles which render the product arresting and distinctive.



A new syrup pack in the form of a jug with a bakelite spout which unscrews.

An attractive square cut marmalade jar and ornamental vase used for marketing marmalade and preserves.

lished itself in the brewing trade. Eighteen leading brewers are now employing it and some of the lithographed labels produced are distinctly bright and attractive. Apart from a special lining, the biggest problem manufacturers had to face was the production of a can which could be filled and capped in existing brewing plant. This requirement was satisfactorily met by the introduction of the cone top can, having a filling aperture equalling that of the established bottle taking a crown cork seal. The open top or flat top can adopted in America was for this reason unsuitable.

In canning it is not possible to check the fill by sighting, and this is done by weighing; whilst, for applying crown corks, adjustments made to the ordinary crowning machine reduce the pressure—which does not need to be so high for canning as for bottling—and modify the "throat" to take the different conformation of the cone top.

Attention has already been turned to the canning of wines, fruit juice, and mineral waters on similar lines, and again experiments have been directed towards the evolving of a satisfactory lining compound for those liquids. The cans of Roma wines from California illustrate a leading development in the U.S.A. The cans are vacuum sealed.

Less spectacular, but of greater importance in so far as it serves many products, the development of "air conditioned" containers "Nuvac" and "Scruvac," which put the cold vacuum process on the map, represents a solution of a ticklish production problem. The secret of success lies in the evolution of a sealing compound which will not slip or tear when the lid is screwed tight. Coincident with the successful production of a suitable container, the manufacturer's introduction of economical vacuumising and sealing equipment for the cold vacuum process placed "air conditioned" packaging within the scope of all packers. A further refinement worthy of note is that although completely sealed and airtight, cold vacuum packs are easier to open than non-airtight packs —the vacuum is broken by levering up the lid with a coin—and where the "Scruvac" tin is employed there is a positive reseal by means of an interrupted screw thread cap.

Valve End Cheese Can

The valve end cheese can—an open top can, provided with a simple relief valve and rubber diaphragm (upon which its efficiency depends)—allows gases to escape but will not admit air. This made possible the canning of another product by first overcoming the problem of curing —hitherto an insurmountable obstacle in cheese packaging. Other metal production achievements include two closure developments; one being a wide aperture easy opening tin which facilitates filling and renders the contents conveniently accessible, and the other the diaphragm lever lid tin—a further development of the lever lid closure. The latter incorporates a paper diaphragm for product protection.

The curved sided tin represents a big step forward in methods of shaping, spinning to shape being accomplished without cracking or distorting the ink; whilst reintroduction of the Sylvetch decorative process, originated some years ago, and progress in seam-sealing methods—*i.e.*, employing rubber compound instead of solder—are affording a higher standard of metal container decoration.

METAL CLOSURES AND ACCESSORY UNITS

Development in production and presentation of closures and accessory units has been influenced by progress in type of food containers generally and table containers in particular. First to enter this field was the moulded plastic cap, which threatened to oust the established metal

Cans for wine from California, a leading packaging development from U.S.A.

The Scruvac Reseal Pocket Vacuum Tin, which incorporates a positive resealing device, taking the form of an interrupted screw thread closure which, by means of a special vacuum sealing compound used in the lid, enables the tin to be completely resealed after opening.

cap from the market. The year 1936, however, staged the come-back of metal by the introduction of double shell caps such as "Selex" and "Duplex" and the single shell "Unishell". Presenting a similar finish to that of the moulded plastic in appearance, the chief advantages of the modern metal cap over its plastic contemporary are that it is more economical to produce, can be decorated in any colour combination, and it may be screwed tightly without splitting.

The Elusive Key Opener

Established methods of attaching a key opener to the can have long been unsatisfactory, soldered or spot welded keys frequently becoming detached before reaching the consumer, while the key held under the wrapper necessitates extra production cost of wrapper. The problem was tackled early in 1936 and the requirements satisfactorily met by the method of crimping the key to the can edge. At present employed only on cans of the scored band type, experiments are in progress to extend this method of attaching the opener key to all types of key opening cans.

METAL FOIL AND ITS USES

The foil-lined board container for bulk packaging biscuits seeks to displace the established biscuit tin and bring about an important change in methods of biscuit packaging. The construction consists of a combination of aluminium metal foil, paperboard, and waxed paper, which, it is claimed, keeps biscuits in perfect condition and affords adequate protection during transit. When packed, all joints are sealed with aluminium foil, rendering the container airtight and the contents unaffected by atmospheric conditions. The importance of such a development makes one ask the question: Is this newcomer going to be to the biscuit trade like the waxed container to the milk trade and the metal container to the brewing trade? It certainly looks very much like it.

A plastic tea barrel, specially treated to remove the odour associated with bakelite, and an outstanding example of the improvement in decorative processes on tinplate.

The valuable insulating properties of the recently introduced reinforced aluminium foil bag render it an economical packaging medium for all food products requiring such protection. Foil is lined on to either a greaseproof or bond paper, and the bag is produced in flat and satchel shape. In addition to its use as a wrapper the employment of aluminium foil in greater thicknesses for bottle caps and jar closures has been materially increased, an outstanding example being its widespread use as a milk bottle closure, for which purpose it shows promise of becoming standardised. Then aluminium foil has become very popular as a medium for labelling, a notable example being the Kia-Ora label illustrated.

(*Continued on next page.*)

NEW YEAR WISHES

DURING the past month we have received a number of greetings for the New Year, and calendars. From the Government Soap Factory at Bangalore, an attractive carving (in sandalwood) of the god Krishna. New Year Greeting Cards, from the Punjab National Bank, Lahore; from R. N. Mehta, Lahore; Philippidis Brothers, Chunking, China; Mohan K. Shah, Bombay; W. H. Pigalle, Milan; Hugh W. Busha, Port Talbot; Purdy Patent Machinery, London; Hugh Dickson; Dr. Voge; Bruno Court and C.A.P.P., Grasse; Mr. Thomas McLachlan.

Gifts: Butterfields of Shipley sent a very handsome clothes brush, accompanied by the following message: "That your Christmas may bristle with happiness and your New Year be the best ever—with no trouble that you cannot easily brush away—these are the cordial wishes of Butterfields of Shipley".

Joseph Storey and Co., Ltd., of Lancaster sent from their London Office an attractive letter opener with magnifying glass.

Diaries: Brush Electrical Engineering, a diary exactly as last year, with your contributor's initials.

Bayer Products, a diary and pocket-book carrying an amount of data very useful to the medical profession.

A neat Prujean pocket-book from Mr. Bernard L. Hooper of W. P. Griffith.

Another handy-sized diary from the Brush Electrical Engineering, with Mr. Lewis Hart's compliments.

A spiral-bound notebook from Thomas Broadbent, Huddersfield.

A handsomely produced desk notebook from the Kynoch Press, and another from Grosvenor Chater.

A leather-bound desk memo from W. Speaight and Sons, Ltd.

Calendars: The usual handsome production from *The Times*, with a picture of Printing House Square, and a beautifully produced calendar from the *Daily Telegraph*. The Anchor Chemical Co. strike a note of humour, again using their calendar showing three months at a time. Wiggins Teape, a beautiful "British Portrait Painters of the XVIII century". Williams of Hounslow send an engagement and memorandum pad; Trepur Paper Tube of Perivale a daily block calendar; Chuit Naef of Geneva have again produced their beautiful calendar with a remarkably fine colour photograph of Swiss scenes. Raybestos, the only calendar we have received using the feminine motif. Croft's Motors, a monthly calendar, each tear-off showing some of their manufactures, with an interleaved transparent sheet showing their motors in use. A wall calendar, showing two months at an opening, from Watson Laidlaw of Glasgow, each tear-off showing their manufactures in use under factory conditions. Chas. Zimmermann and Company, Ltd., sent a litho calendar of simple and attractive design, with a very large and clear daily tear-off; Arthol Manufacturing Co. of Chester sent a calendar beautifully printed in full colour, with a daily tear-off pad; Stothert and Pitt a desk memo calendar. The illustrations showing their equipment are very well done. British Vegetable Parchment Mills sent two packs of playing cards, with Mr. James Strachan's compliments. H.M. King George VI is used by Harrison's, the printers. This is the only calendar of its kind we have so far seen. Gale and Polden sent a lithographed sheet of "Old Regent Street" which is pleasant; Boake, Roberts and Co., Ltd., a daily block calendar of the pattern which has now become almost part of the furniture of so many offices in the trade; and Stafford and Co., Ltd., a very attractive full colour daily pad calendar. S. Briggs and Co., Ltd., of Burton-on-Trent, manufacturers of food and process plant of all descriptions, sent a most useful calendar-blotting pad, with memo spaces for each day of the year.

Calendars also received from: Crossley Brothers, of gas engine fame; C. Townsend Hook and Co., Ltd.; G. and J. Kitcat, Ltd., Henry E. Hawkins and Son, Ltd.; H. J. Ryman, Ltd.; Flowerdew and Co., Ltd.; the *Kentish Times* Newspapers; Jas. Broadley, Ltd.; G. T. Northover and Son, Ltd.; Milsom's Office Equipment; Gubbins Bros.; *Industrial Daily News*; F. J. Parsons, Ltd.; Bradley and Stone, Ltd. (who make a feature of the Coronation and use the national colours); Star Illustration Works, Ltd.; Loxley Bros., Ltd.; Standard Synthetics, Ltd.; Blackfriars Press, Ltd.; and a New Year Card from Buchanan Taylor (of Lyons') in his usual whimsical manner.

From Mr. T. G. King, J.P., of Messrs. George Morgan and Company, Ltd., Clarence Street, Sydney, there has reached us a very beautifully produced work entitled *Australia To-day, 1937*. Others from: The *Mining Magazine*, the *Observer*, the *Chemical Trade Journal*, the *South London Press*, the *Whitby Gazette*, William Clowes, the *Yorkshire Evening Post*, Hudson and Kearns, the *Financial Times*, the *Financial News*, the Fred Collins Company, the *Meat Trades Journal*, H. R. Grubb, Ltd., P. A. Cramer and Co.; W. P. Griffith and Sons, Ltd., the American Shipping Co., and J. W. Ruddock and Sons.

PACKAGE CAVALCADE

(*Continued from page 47.*)

COMPOSITE CONTAINERS AND CARTONS

Straight wound rectangular composite containers are now being produced in this country, and other geometrical shapes are on the way. An important manufacturing refinement in the production of these canisters allows lithographed labels to be applied by a labelling device during the process of winding, thereby avoiding a later labelling operation. The advantages of the straight wound rectangular over the established cylindrical container in use is its "flat" copy face, conducive to more effective shelf display and closer packing into the shipping case.

Whilst from the point of view of construction few exceptional cartons have been produced, the year has been marked by improvements in materials which effect economy in production costs. Lined materials for outers have replaced the thicker and more expensive pulpboards, over which they have the advantage of being more pliable and less inclined to crack when made up. Greaseproof paper-lined boards have been developed for the marketing of certain food products, metal-lined boards for others, and the use of the waxboard carton has been extended to accommodate dry ice.

What of the Future?

Experiments now in progress foreshadow further developments in established packaging and marketing methods. Dry products in moulded plastic containers, beer in cartons, wines, spirits and mineral water in cans are the chief indications that this year's packaging progress may be even more sensational than the year just reviewed. Though the Coronation may not stimulate the production of anything new in the manner of packaging it will certainly be an occasion for manufacturers of packages and packaging materials to put forward their best artistic and constructive efforts.

V. E. S.

CEREAL CHEMISTRY in 1936

(The second and concluding part of the article in our January issue)

By T. H. FAIRBROTHER, M.Sc., F.I.C.

(Chief Chemist, McDougall's Limited)

Storage Pests and Fumigation

THE STORAGE of cereals is always a problem for farmers and millers alike, and a certain amount of research is devoted to these matters. Aamodt and McCalla (*Can. J. Res.*, vol. 13, sec. C 160) have found a marked difference in the keeping quality of flours from hard red spring wheats grown on fertile black soil and infertile grey soil. The flour from most of the samples grown on black soil retained its baking quality for at least two years after milling, but flour from most of the samples grown on grey soil had deteriorated so much after ten months' storage that it was unfit for breadmaking. McCalla, also, found that the effect of frost was so deleterious to the keeping properties of flour milled from immature wheat that even samples which at first made satisfactory bread become unfit for use after several months' storage. In an interesting paper (*Canad. J. Res.*, vol. 12, 627) Larmour, Clayton and Weanshall state that the germination and growth of fungi, which are largely responsible for heating and damage in damp wheat, can be controlled effectively by the vapour of toluene or carbon tetrachloride. While this is an interesting discovery, it would not appear to be of practical value. The use of toluene vapour might lead to fires or explosions, and carbon tetrachloride might leave an objectionable flavour.

Most millers nowadays devote very careful attention to grain and granary pests and methods of extermination. Hydrogen cyanide is one of the most popular fumigants, but according to Young, *et alia* (*Chem. Abs.*, 1936, vol. 30, 4937) flour cannot be adequately fumigated with hydrogen cyanide at atmospheric pressure. Vacuum fumigation ensures quick and thorough penetration and greater destruction of insects. For general purposes, 8 gm. HCN per 10,000 lb. flour and a 3-hour exposure with 28-inch vacuum at 21° C. is efficient. This may be all right in theory, but the writer would like to find the flour mill where a 28-inch vacuum at 21° C. could be maintained for 3 hours!

An apparatus has been patented for blowing a gas through solid particles such as calcium cyanide, which gives off toxic material (HCN). According to Cotton and Young (*Chem. Abs.*, 1936, vol. 30, 1174), solid carbon dioxide is used with ethylene oxide, carbon disulphide and other fumigants, for combating insects such as *Tribolium confusum*.

The Wheat Bug

Several interesting papers have appeared recently on the wheat bug and its effect on dough. Kranz (*Mühlenlab.*, 1935, vol 5, 177) showed that while the bushel weight, specific gravity, and protein content of wheat attacked by the wheat bug are all normal, the gluten content and gluten swelling factor are lowered. Kranz recommends the use of higher conditioning temperatures and bromate treatment of the flour. According to Mohs and Klemt (*Z. ges. Getreide-u-Mühleuw.*, 1936, vol. 23, 1), the only baking characteristics affected were the grain and elasticity of the crumb. Diastatic and proteolytic activities were increased. Berliner (*Mühle.*, 1936, vol. 73, 127) has discussed the relation between the presence of the wheat bug and "gummy" gluten. According to him a strong bromate treatment of the flour reduces the damage. He also recommends a very acid fermentation (sour doughs) and the use of large amounts of salt. The wheat bug undoubtedly is responsible for some curious baking results. It is not easy to detect the attacked berries. The perforation is very small. In soft wheat it is brownish, and is surrounded by a yellowish brown growth. A very good description, with illustrations, of these bugs is to be found in a paper by Schulze (*Getreide-u-Mühleuw.*, 1935, vol. 22, 211).

A very useful bibliography of literature relating to hydrogen cyanide fumigation has been compiled by Wilmot (*Florida Stat. Exp. Stat. Res.*, 1935, vol. 73, 508). An experimental apparatus for testing the toxicity of gaseous fumigants to the granary weevil and other insects under varying conditions of temperature, time, and concentration was described by Peters and Ganter (*Z. Ges. Getreide-Mühlen-Bäkereiw*, vol. 22, 122-31). Curves are given showing the concentration and time required for a 100 per cent. kill with HCN and ethylene oxide at different temperatures.

Wheat Conditioning

Of all the problems related to large scale methods probably the conditioning of wheat has received the most attention. The main result seems to be a clear indication of the importance of heat in conditioning, which brings about an improvement in milling and in baking quality. The explanation of this improvement and the factors that are brought into action are still matters of controversy.

Kretovich and Riazantzeva (*Chem. Abs.*, vol. 30, 1445) have investigated the effect of high temperatures on biochemical changes. Denaturation of gliadin was increased and the hydration of gluten markedly decreased by heating to 90-130° C. Diastatic activities increased distinctly at 60-90° C. Catalase activity falls off rapidly on heating to 90° C., even with dry grain, and it is suggested that control of grain drying and high temperature conditioning could be based on the determination of catalase activity. A good, wide description of conditioning methods and the influence of heat was provided by Ward (*Milling*, vol. 86, 409). Descriptions of conditioning methods on the Continent are given in two papers by J. Vermeylen (*Bull. de l'Ecole de la Meunerie Belge*, 1935, 61-66 and 103-120).

Improvers and Bleachers

Some investigations have been made on the effect of chemical improvers on the nutritive value of flour. Becker and Hangar Szabo (*Mühlenlab.*, vol. 6, 63) fed rats with a balanced ration containing flour to which various oxidising agents had been added in concentrations greatly in excess of those ordinarily used in flour treatment. They found no harmful effects when the improvers were added in concentrations 10 times as great as those used in flour, and in most cases no harmful effects when the concentration was 100 times as great. On the other hand, Daranyi and Vitez (*Z. Unters. Lebensm.*, vol. 68, 597) and Vitez (*ibid.*, vol. 70, 258; *C.A.*, vol. 30, 1130) carried out feeding experiments with flour treated with oxidising and bleaching agents, and found that when rats, mice and dogs were fed exclusively on treated flour their development was hindered and their state of health harmed, largely because of the destruction of carotin. These investigators, however, do admit that treatment with oxidising and bleaching agents does no harm to man with a properly balanced diet, but maintain that the food value of the flour is lowered.

Potel (*Ann. agron.*, vol. 5, 690) has reported certain modifications of the plastic properties of dough by oxidising and reducing agents. Small amounts of hydrogen peroxide increase the tenacity and elasticity of the gluten. Potassium bromate, iodate and chromate and benzoyl peroxide had either none or unfavourable effects. Sodium perborate, sodium peroxide and ammonium persulphate acted like hydrogen peroxide. Certain reducing substances had a very depressing effect on the results obtained on the Chopin Extensimeter. Gluten washed with very dilute solutions of perborate, persulphate, or peroxide of soda had more tenacity and coherence, while gluten lost its cohesion when treated with dilute solutions of sodium thiosulphate, mercuric chloride, and potassium cyanide.

A review of methods for detecting and estimating bleaching agents and chemical improvers in flour is given by Radeloff (*Z. Unters. Lebensm.*, vol. 70, 169). Joos has patented a process for improving flour by mixing 4 parts of the flour with 1 part of a phosphatide vegetable oil mixture containing about 35 per cent. oil (B.P., 436,050, 1935). According to Hullett, vitamin C (or lemon juice) is a satisfactory substitute for potassium bromate. A patent for the use of ascorbic acid as an improver has been taken out by Dansk Gaerings-Industri (F.P. 792,675). According to Kronberg (*Chem. Abs.*, 1936, vol. 30, 4583), improvers are made from a mixture of products from skim milk inoculated with lactic acid bacteria in the presence of nutrient material. These are protected by several Swedish patents.

Wheat Germ

The increasing use of wheat germ as an invalid food and the use of wheat germ oil for various purposes has transformed wheat germ from being a wheat offal to an important commercial product. Formerly, most of the germ found its way into the middlings. To-day these are worth about 7s. a cwt., whereas clean, separated germ is worth 20s. Various methods have been employed to separate the germ. The usual method is to roll the germy stock and then sift out the flattened germ. Wheat germ is unstable and soon becomes rancid, and a good deal of research has been devoted to improving its keeping properties. According to an article in Mühle (vol. 72, 1132) wheat germ can be sterilised by drying, preferably in a vacuum. The dried germ keeps for weeks if stored in a cool, airy place. It can also be stabilised by the addition of fat stabilisers. Cerobrex, Ltd., have patented a process (B.P. 436,765) whereby wheat germ is stabilised for incorporation into white flour by mixing with 5-8 per cent. salt (to absorb moisture and inhibit the yeast activity) prior to, during, or subsequent to grinding to approximately the granulation of flour, and then thoroughly mixing with an inert non-fatty filler—*e.g.*, potato flour.

The influence of germ on baking quality has been investigated by Sullivan, Near and Foley (*Cereal Chemistry*, 1936, p. 453). They find that fresh germ has a very deleterious effect on the baking quality of patent flour, which effect is much reduced by storage at relatively high moisture content at room temperature in a sealed container. The constituent responsible is extracted by water, but not by fat solvents. It has not yet been identified. Drummond and his colleagues (*Biochem. J.*, vol. 29, p. 2510) have continued their researches on the constituents of the unsaponifiable fraction of wheat germ oil. Several definite fractions have been separated. One appears to consist of a hydrocarbon with a probable formula $C_{18}H_{38}$. Although similar to iso-octadecane (pristine) differences in some of the analytical figures point to a separate compound. A highly unsaturated hydrocarbon was also obtained. The formula of this appears to be $C_{45}H_{76}$. The fraction containing vitamin E. contains a new sterol, having a probable formula $C_{29}H_{48}O_2$.

There are many other interesting sections of cereal chemistry in which progress has been made, such as psychological studies to explain the flavour factor of bread, causes of staling in bread, further investigations into the colouring matters in flour, such as the flavones, to mention but a few. In a review of this description, however, only broad outlines of general progress can be given. In conclusion it must be said that great progress has been made in improving many analytical methods, and some new ones have been developed. These have not been referred to here as they were fully dealt with in a series of articles by the present writer in the September, October, and November, 1936, issues of FOOD MANUFACTURE.

BOOK REVIEWS

Three Books on Marketing

Various aspects of markets and marketing are discussed in these three books, the first of which is a study of the development of artificial control in the primary industries during recent years, and the second and third studies of marketing from a world point of view and from a British point of view.

Markets and Men, by J. W. F. Rowe, M.A., deals in the first seven chapters with the origin and growth of control schemes and the methods in which control schemes have been applied to different commodities. The three main commodities dealt with of interest to the food industry are coffee, wheat, and sugar.

There can be no doubt that a change of a revolutionary character has taken place in the economic world with the evolution of collective conscious control of supplies by the producers in a large number of industries; or to put it in everyday language, the appearance of restriction and valorisation schemes, not only of national, but also of international or even world-wide extent. Twenty-five years ago anyone who prophesied that the world supply of most of the important primary products would be subject to artificial control as the result of agreement between the producers or their governments, would not have commanded one minute's attention from economists, business men, or politicians.

Nowadays the great majority think that individualist *laissez-faire* has certain shortcomings under present economic conditions but, at the same time, cannot persuade themselves that schemes for the artificial control of the production or accumulated stocks of primary products are always economically sound and desirable.

The history of most of these restrictions schemes is an unfortunate one, involving in many cases the building up of huge stocks while maintaining the price of the commodity and the liquidating or extinction of these stocks at a loss. While the schemes are in being, however, certain individuals make large profits and the conception of the "sovereignty of the consumer" is forgotten.

The last four chapters deal with the troubles which give rise to restriction schemes, the economics of restriction schemes in world prosperity and in world depression and the economics of valorisation schemes. We do not yet know enough about the way in which artificial control schemes work out in the long run, but this book should be of assistance in forming the best judgment possible at the present time.

World Marketing, by V. D. Collins, has been written in order to help and guide the world trader or the trader who contemplates entering the world market. It has been written not for the merchandiser of any particular commodity but for the merchandisers of any commodity that may conceivably be sold abroad. The author has been associated all his commercial lifetime with the developing of world markets and in the foreword of the book he states his purpose to be twofold: first, to awaken American enterprise to the urgent and immediate necessity for adequate development that the enormous world market affords for increased sales and profits; and, second, to lead the manufacturing or mercantile enterprise, be it large or small, in a clear, concise manner through the successive requirements which will ensure an increasingly profitable business and permanency in the embracement of world markets under the new and complex conditions which have arisen out of the world depression.

Part I deals with the vital research which is essential on the part of the world trader preparatory to profitable and permanent participation in the world market; Part II deals with the principles and methods under which profitable consumer accessibility and consumer consciousness for your product may be achieved abroad; and Part III deals with the everyday processes in the shipment of an export order.

The third book is a marketing survey of the United Kingdom, which gives a large volume of information in a concise and convenient form. Should you be interested in Grimsby, for instance, you turn to the pages headed "Grimsby," and there you find all the facts you require from the latest mid-1935 population estimate to the newspapers published there and from the city's relative purchasing power to the poster services available. Thus details will be found for every town market of 5,000 inhabitants or over, some 1,300 centres in all. The 136 cities and towns containing over 50,000 inhabitants are dealt with in great detail; for each of the markets available data is given individually. To further facilitate easy reference an index by place name is given. The market is thus broken up into the smallest possible units.

The original contribution of the survey is the Purchasing Power Index prepared under the control of a leading authority on applied statistics. It shows the relative purchasing power of each of the 100 largest markets as compared with the national average. This gives the relative importance and the special possibilities of any large market in a campaign. The book also includes a series of maps of the markets surveyed.

R. D. V. R.

Markets and Men. By J. W. F. Rowe, M.A. Price 7s. 6d.
World Marketing. A Complete Guide to World Market Merchandising and Selling of the New Era. By V. D. Collins. Price 10s. 6d.
Marketing Survey of the United Kingdom, Price 40s.

Tinplate—2,000 Years of Development

Mr. W. Robson Brown, managing director of the Old Castle Iron and Tinplate Co., Ltd., of Llanelly, has sent us a copy of a little book about tinplate that he had written, because, as he says in his preface, he thinks a simple, general description of the processes of manufacture of a sheet of tinplate would prove of interest to all concerned with the tinplate industry and its prosperity. It is written simply for the non-technical reader and goes further than a description of the processes of manufacture involved. It includes the story of tin from the days of the Phœnicians and traces the development of tinplate from the first mention of it by Pliny as existing prior of A.D. 23. Legend has it that a Cornish tin miner, owing to a disagreement, fled into South Germany, where the discovery of tin in the Erzgebirge Mountains of Bohemia led to the establishment of a tinplate industry. At any rate, that is the first instance mentioned in a chronology which commences at *c* A.D. 1240. At the end of the book are tables of data concerning hardness, weights, and sizes of tinplates, and other physical and chemical data. The book is strongly bound.

G. W. L.

Tinplate. W. Robson Brown. Llanelly. 1936.

EMPIRE CANNERS' COUNCIL

As a result of the overseas fruit growers' conference last year, a new body has been formed known as the Empire Canners' Council, with Lord Strathcarron as Chairman and Mr. H. C. Gill as Secretary.

The Empire Canners' Council will be independent of, but affiliated to, the British Empire Producers' Organisation.

The Processed Fruit Committee of the organisation has been reconstituted as the Dried Fruit Committee.

NOVEL PACKAGES of 1936

(1) (2) (3)

(4) (5)

(6)

(1) A box of fish rissoles in transparent material. The top of the box forms the display shown in the picture.

(2) The "Seavite" sealed waterproof wrapper, consisting of a special envelope in which to pack the fish and which fits into an ordinary wooden fish-box.

(3) A glass rolling pin designed and produced by Owens-Illinois in the U.S.A., and which serves as a container for Shenandoah Valley vinegar.

(With acknowledgments to Modern Packaging, U.S.A.)

(4) Red bakelite moulded Jiffy ketchup cap and Jiffy utility cap. Former is threaded and fits snugly over top of an ordinary ketchup bottle, permitting easy pouring without waste, while latter is used on wide-mouthed food jars.

(With acknowledgments to Modern Packaging, U.S.A.)

(5) An interesting double bottle for lemonade. The large lower bottle contains stabilised juice and pulp of lemons and the small upper one oil of lemon peel. The juice is without sugar, which is added to taste.

(6) Besides the strong appeal of Peek, Frean's Vita Wheat Carton, which by reason of its height towers above its shelfmates, the outstanding feature of this striking biscuit pack is the employment of metal ends which ensure permanent rigidity of the carton. Further, the metal lid affords a tighter closure than is possible with the ordinary board carton.

(7) A new type of can having a score running round the top edge just below one of the end seams. The method of opening is to place the hook portion of the opener on the top of the can, taking a bearing on the top seam, and push downwards when the projecting part of the opener will break the score and force in the body for a short distance. The opener is then pushed on a little further and levered upwards when the can lid will come off completely as the score tears all round, leaving a smooth edge.

(8) A box of mushrooms, showing the mushrooms packed with the box upside down. The mushrooms are surrounded with tissue paper and a piece of card fitting into slots closes the bottom of the box.

(With acknowledgments to "Shelf Appeal.")

(9) Toffee apples are now being packed in cartons printed in blue on yellow. The apple is wrapped in paper and the stick protrudes through the lid.

(With acknowledgments to "Shelf Appeal.")

(7)

(10)

(8)

(9)

(11)

(12)

(10) Coffee beans and oat puffs attractively packed in transparent material.

(11) Pearlite containers for bulk packing (up to 28 lbs. and 2-gallon capacity) as used by Messrs. Bird for their custard powder.

(12) A caviare tin which has a deep lid to allow for expansion of the caviare.

BRITISH INDUSTRIES FAIR, 1937

General Information for our Readers

THE 1937 British Industries Fair, which is to be held in London at Olympia and the White City and in Birmingham at Castle Bromwich from February 15 to 26, will be the biggest and most impressive which has yet taken place.

The record area occupied last year has been exceeded by more than 10,000 square feet, so that Coronation year will rank as one of outstanding achievement in the history of the Fair.

Eleven sections covered by the catalogue will be larger than last year. Of the 1,507 exhibitors London itself sends the largest number, 781; Birmingham with 134 is second, Canada with its composite commercial exhibit and the Potteries with 65 each tie for third place, and India and Manchester with 47 each come next.

More than sixty countries will be represented by the trade buyers who intend to visit the Fair. Holland heads the list, and other countries well represented are Germany, Belgium, France, Denmark, U.S.A., Sweden, and Poland. Spain is a notable absentee this year, but Italy is well represented.

Travel Facilities

Special travel facilities are available for all visitors. Fare reductions ranging from 10 to 50 per cent. are obtainable by visitors travelling by sea, rail, or air from Europe. Twelve air lines are giving a rebate of 10 per cent. on single and return tickets. Intending visitors should apply to the nearest British Embassy, British Legation, or British Consulate for vouchers which will entitle them to the travel concessions offered by the various British and European railway companies, steamship lines, and airways companies. Full information with regard to the concessions can be obtained from the chief travel agencies in Europe.

Times of Admission

The London Fair is open to trade buyers from 9.30 a.m. to 7.30 p.m. daily. Admission is by trade buyer's badge, which is obtainable at the entrances (price 2s.) on presentation of the Department's card of admission or the buyer's business card. The public will be admitted daily, on payment, from 4.30 p.m. to 7.30 p.m. except on Saturday, February 20, and Friday, February 26, when they will be admitted throughout the day.

The Birmingham Fair will be open daily from 10 a.m. to 6.30 p.m., and it will be also open during these hours to the public, on payment.

LONDON SECTION

The exhibits to be shown at Olympia will include silver and electroplate, glassware, china, earthenware and stoneware, paper, printing and stationery, scientific and optical instruments, chemicals, drugs and druggists' sundries, foodstuffs and beverages, confectionery, etc. There is nothing of interest to our readers at the White City.

EXHIBITS AT OLYMPIA

The Paper, Printing and Stationery Section:	*Stand No.*
British Cellilynd, Ltd.	B 352
Corrugated Packing Materials Co., Ltd., The	B 386
Dickinson, John, and Co., Ltd.	B 350
Ford, T. B., Ltd.	B 396

The Paper, Printing and Stationery Section (continued):	*Stand No.*
Freeder Brother Paper Mills	B 301
Freeder Crepe Paper Mills, Ltd.	B 377
Livermore and Knight, Ltd.	B 307
Mansell, Hunt, Catty and Co., Ltd ...	B 325
Sanderson, Arthur, and Sons, Ltd. ...	A 41 & 91
Transparent Paper, Ltd.	B 348
Wiggins, Teape and Alex. Pirie (Sales), Ltd.	B 357 & 365

The Chemical Section:	*Stand No.*
Albright and Wilson, Ltd.	A 168
Boake, A. Roberts and Co., Ltd.	A 169
British Drug House, Ltd.	A 221 & 225
British Fumigants Co., Ltd., The ...	A 226
Bush, W. J., and Co., Ltd.	A 171
Detol Products, Ltd.	A 258
Hopkin and Williams, Ltd.	A 251
Howards and Sons, Ltd.	A 222 & 224
Imperial Chemical Industries, Ltd. ...	A 170 & 174
Monsanto Chemicals, Ltd.	A 173
Whiffen and Sons, Ltd.	A 192
Williams (Hounslow), Ltd.	A 196

The Scientific and Optical Section:	*Stand No.*
Bellingham and Stanley, Ltd.	A 52
Hanovia, Ltd.	A 108
Tintometer, Ltd., The	A 79

The General Section:	*Stand No.*
Eburite Corrugated Containers, Ltd. ...	K 1347
Guelph Cask, Veneer and Plywood Co., Ltd.	K 1350
Medway Corrugated Paper Co., Ltd., The ...	K 1351
North-Eastern Trading Estates, Ltd. ...	K 1334
Packers Supply Co., Ltd.	K 1352
Pearlite Box Co., Ltd.	K 1344

The Pottery and Glassware Section:	*Stand No.*
Jackson Bros. (of Knottingley), Ltd. ...	C 458

The Foodstuffs Section:	*Stand No.*
Booth, Reginald George	H 1062
Chocolate Products Co., Ltd.	H 1064
Overtons Chocolates, Ltd.	H 1061
Sozol (1924), Ltd.	H 1063

The Silver, Jewellery and Plate Section:	*Stand No.*
Johnson Matthey and Co., Ltd.	D 565
Smith's English Clocks, Ltd.	E 639

The Druggist Sundries Section:	
Rozalex, Ltd.	H 1041
Viscose Development Co., Ltd., The ...	H 1069

BIRMINGHAM SECTION

All the machinery exhibits of interest to the food manufacturer are to be seen at Castle Bromwich, Birmingham. The machinery is grouped under the following divisions: A Stand numbers refer to Hardware, Ironmongery and Brassfoundry exhibits; B, Building exhibits; Ca, Gas exhibits; Cb, Electricity exhibits; and D, Engineering exhibits.

Main line expresses from all parts of the country stop specially at Castle Bromwich during the Fair. There is a good service of trains between London and Birmingham

Although the official catalogue of the British Industries Fair states that "Food Manufacture" will be represented at Olympia, we would take this opportunity of informing our readers that this statement has appeared owing to an oversight on the part of the authorities and that we shall not be exhibiting.

and adequate facilities for travelling to and from Castle Bromwich, so that visitors will find no difficulty in attending both branches of the Fair.

Exhibits at Birmingham

The Hardware, Ironmongery and Brassfoundry Section:	*Stand No.*
Barrett and Elers, Ltd.	A 305
Bulpitt and Sons, Ltd.	A 517
Butterfield, W. P., Ltd.	A 601
Follows and Bate, Ltd.	A 427 & 322
Gloucester Development and Publicity Committee	A 414
Holden, A., and Sons, Ltd.	A 524
London Aluminium Co., Ltd.	A 511 & 408
Midland Metal Spinning Co., Ltd.	A 611 & 510
Midland Fan Co., Ltd.	A 716
Salter, Geo., and Co., Ltd.	A 507 & 404
Williamson, G. H., and Sons, Ltd.	A 406

The Building Section:	*Stand No.*
Aquamellis Engineering Co., Ltd.	B 621
Ashwell and Nesbit, Ltd.	B 403 & 302
B.E.N. Patents, Ltd.	B 825 & 736
Bowran, Robert, and Co (1934), Ltd.	B 801
Cannon Ironfoundries, Ltd.	B 713
Cellactite and British Uralite, Ltd.	B 823 & 734
Crane, Ltd.	B 308
Cuxson, Gerrard and Co., Ltd.	B 806
Fry Bros., Ltd.	B 339
Greener, W. W., Ltd.	B 426
Harvey, G. A., and Co. (London), Ltd.	B 723 & 622
Hope, Henry, and Sons, Ltd.	B 727 & 616
Lloyd, Ed., Wallboards, Ltd.	B 809 & 720
Mirrlees, Bickerton and Day, Ltd.	B 420
National Safety Services, Ltd.	B 516
Pinchin, Johnson and Co., Ltd.	B 515 & 414
Prior Burners, Ltd.	B 405
Ruberoid Co., Ltd., The	B 411
Slingsby, H. C.	B 519
Standard and Pochin Bros., Ltd.	B 817 & 728
Venesta, Ltd.	B 811 & 722

The Gas Section:	*Stand No.*
Averill, C. R., and Co., Ltd.	*Ca* 309
Grant and West, Ltd.	*Ca* 807 & 706
Oxley Engineering Co., Ltd.	*Ca* 915
Thomas and Bishop, Ltd.	*Ca* 912
Turner's Asbestos Cement Co.	*Ca* 401

The Electricity Section:	*Stand No.*
Bristol Authority, Port of	*Cb* 901 & 800
British Electrical Development Association Inc.	*Cb* 507 & 406
British Thermostat Co., Ltd.	*Cb* 900
British Thomson-Houston Co.	*Cb* 607 & 504
British Vacuum Cleaner and Engineering Co., Ltd.	*Cb* 309
Dubilier Condenser Co. (1926), Ltd.	*Cb* 819 & 718
English Electric Co., Ltd.	*Cb* 609
Evershed and Vignoles, Ltd.	*Cb* 313
General Electric Co., Ltd.	*Cb* 617 & 514
Gent and Co., Ltd.	*Cb* 606
George, W. & J., Ltd.	*Cb* 715
G.W.B. Electric Furnaces, Ltd.	*Cb* 403 & 302
Higgs Motors, Ltd.	*Cb* 408
Johnson Matthey and Co., Ltd.	*Cb* 312
Leda Electric, Ltd.	*Cb* 705
Morrison, A. E., and Sons, Ltd.	*Cb* 812
The Rapid Magnetting Machine Co., Ltd	*Cb* 512
Rheostatic Co., Ltd.	*Cb* 511 & 410
St. Helens Cable and Rubber Co., Ltd.	*Cb* 501 & 400
Siemens Brothers and Co., Ltd.	*Cb* 501 & 400
Streetly Manufacturing Co., Ltd.	*Cb* 305 & 204

The Engineering Section:	*Stand No.*
Accles and Pollock, Ltd.	D 915 & 812
Aeraspray Manufacturing Co., Ltd.	D 920
Allen, Edgar and Co., Ltd.	D 831 & 730
Angus, Geo., and Co., Ltd.	D 305 & 204

The Engineering Section (continued):	*Stand No.*
Associated Equipment Co., Ltd.	D 820
Avery, W. and T., Ltd.	D 613 & 512
Babcock and Wilcox, Ltd.	D 501 & 400
Barron, W. S., and Son, Ltd.	D 611
Barronia Metals, Ltd.	D 605*a*
Birmingham Barry and Metal Co., Ltd.	D 707 & 606
Bliss, E. W., Co.	D 519
Britannia Tube Co., Ltd.	D 521 & 422
British Aluminium Co., Ltd.	D 911 & 808
British Oxygen Co., Ltd.	D 511 & 410
British Rema Manufacturing Co., Ltd.	D 804
Brockhouse, J., and Co., Ltd.	D 518
Chesterfield Tube Co., Ltd.	D 709 & 608
Controlled Heat and Air, Ltd.	D 327 & 226
Danks and Co., Edwin (Oldbury), Ltd.	D 501 & 400
Dick, R. and J., Ltd.	D 313
Dunlop Rubber Co.	D 609
Ewart Chainbelt Co., Ltd.	D 603 & 502
Fenner, J. H., and Co., Ltd.	D 620
Firth-Vickers Stainless Steels, Ltd.	D 513 & 412
Firth, Thos., and John Brown, Ltd.	D 408
Fox, Saml., and Co., Ltd.	D 713 & 612
Greenwood and Batley, Ltd.	D 413 & 314
Imperial Chemical Industries, Ltd. (Degreasing)	D 405
Lancaster and Tonge, Ltd.	D 228
Lister, R. A., Ltd.	D 304
Magnetic Manufacturing Co.	D 912
Meldrums, Ltd.	D 212
Moler Products, Ltd.	D 913 & 810
Moseley, D., and Co., Ltd.	D 719
Niagara Screens (Great Britain), Ltd.	D 626
North-East Development Board	D 420
Northey Boyce Rotary Engineering Co., Ltd.	D 326
Riley Stoker Co., Ltd.	D 303 & 202
Rubery, Owen and Co., Ltd.	D 903 & 802
Siebe, Gorman and Co., Ltd.	D 839 & 738
Silvertown Lubricants, Ltd.	D 307
Simon, Henry, Ltd.	D 611
Spiral Tube and Components, Ltd.	D 910
Stelcon (Industrial Floors), Ltd.	D 208
Stewarts and Lloyds, Ltd.	D 601 & 500
Stone, J. B., and Co., Ltd.	D 302
Tecalemit, Ltd.	D 515 & 414
Thompson, John (Wolverhampton), Ltd.	D 909 & 806
Tyneside Industrial Development	D 420
Vacuum Oil Co., Ltd.	D 427
Wakefield, C. C., and Co., Ltd.	D 507
Walker, James, and Co., Ltd.	D 604
Welsh Plate and Sheet Manufacturers	D 328
Wickman, A. C., Ltd.	D 508

SHEA NUTS

In the latest bulletin of the Imperial Institute a report is given of the examination of a further series of twenty-one samples of shea nuts from the Gold Coast.

As was the case with the previous series, on the whole the present Gold Coast samples are richer in oil, and the oils contain less unsaponifiable matter than the Nigerian samples. The oil content of the Gold Coast kernels as received varies from 42·6 to 52·7 per cent., and mainly from 47·7 to 52·7 per cent., the corresponding figures for the Nigerian samples being 27 to 47·6 per cent., and mostly from 34·3 to 47·6 per cent. The unsaponifiable matter in the Gold Coast samples ranges from 3·6 to 8·3 per cent., with an average of 4·9 per cent., and in the Nigerian oils from 5·1 to 16·6 per cent., with an average of 8·8 per cent. From the results it can be seen that, in both cases, the Gold Coast results fall within much narrower limits than those for the Nigerian samples.

NEW LABORATORY for FOOD RESEARCH

SIR WILLIAM BRAGG, P.R.S., inaugurated the new extension of the Research Station of the British Association of Research for the Cocoa, Chocolate, Confectionery, Jam, and Allied Trades and the Food Manufacturers' Research Association at Dalmeny Avenue, London, N.7., on Tuesday, January 19, with an address which must have delighted the many visitors present as much as it did the members of the Associations and the staff of the Station. After the opening ceremony, which took place in the afternoon, visitors were able to tour the laboratories, where a large number of demonstrations of work in progress were given by the staff.

The new extension, which is situated at the rear of the existing buildings, is devoted to work on problems affecting meat and fish products. These are the chief concern of the Food Manufacturers' Research Association. Tests showing the estimation of protein, fat, and SO_2, the determination of the softening point in gelatin jellies, and the salinity of hams and bacon were in progress in the main laboratory. Bacteriological examination of these products is confined to a separate room in the extension, which also has its own storeroom and a room for Dr. Banfield, who is chief chemist in charge of this work under the direction of Mr. McCara. Examples of defective meat and fish products were also displayed in the laboratory.

The rooms of the extension, as can be seen from the illustration, are well lighted with large windows, and the interior decoration is distinctly bright and cheerful—two important points upon which those responsible for the arrangement are to be congratulated. The laboratory is well equipped so that more valuable results should be secured from this welcome expansion of the facilities of the Station.

Above, a view of the main laboratory in the new extension of the Research Station, and (on the right) Sir William Bragg, President of the Royal Society, examining a piece of apparatus during his tour of the new laboratory.

FIFTIETH ANNIVERSARY of CROFTS (ENGINEERS), LTD.

CROFTS (ENGINEERS), LTD., who specialise in power transmitting machinery, general mill gearing appliances, cut gearing, reduction gear units, V-rope driving, variable speed appliances, etc., this year celebrate their fiftieth anniversary. From a small workshop established in 1887 by the late Mr. L. F. Croft, where only wrought-iron pulleys were made, they have extended their activities until at the present time they are the largest sole makers of the wide range of products included in the term "power transmitting machinery." The works at Thornbury, Bradford, Yorks, cover over 14 acres and find employment for more than 1,200 workpeople.

As pioneers in the development of power transmission appliances, Messrs. Crofts introduced belt, rope, chain, and gear drives to meet the new conditions. New devices for the more efficient transmission of power are regularly being introduced to power users. Geared motors are an outstanding development in the design and standardisation of which this firm was a pioneer. V-rope driving has become increasingly popular for short centre drives from electric motors to driven machinery, and Crofts supply drives from fractional horse-powers up to the very largest. Crofts patent variable speed pulley is a device designed in the form of a V-groove pulley arranged to fit on any standard motor shaft and driving the machine by V-ropes, enables infinite speed variation to be obtained up to a maximum of 3 to 1 for single drives or 6 to 1 for double drives. Friction clutches of all types—iron, steel, and non-ferrous castings, as well as many other products —are made by this firm.

INDUSTRIAL NEWS

New Appointment to Nutrition Committee

The Minister of Health, Sir Kingsley Wood, and the Secretary of State for Scotland, Mr. Walter Elliot, have appointed Miss Ruth Pybus to be a member of the Advisory Committee on Nutrition in place of Mrs. Chalmers Watson, deceased.

Miss Pybus is Sister Dietician at Edinburgh Royal Infirmary, and in charge of the School of Dietetics, which is part of the School of Nursing at the Infirmary.

The Health Congress

The Right Hon. the Earl of Dudley has consented to act as President of the Health Congress of the Royal Sanitary Institute, which is to be held at Birmingham from July 12 to 17. He will deliver his Inaugural Address on Monday afternoon, July 12. The Minister of Health, the Right Hon. Sir Kingsley Wood, will address a General Session of the Congress on Tuesday.

The deliberations of the Congress will be divided among eight sections, and include sections dealing with Preventive Medicine, Veterinary Hygiene, Hygiene in Industry, and Tropical Hygiene.

In addition, there will be conferences of Representatives of Local Authorities, Medical Officers of Health, Engineers and Surveyors, Sanitary Inspectors, and Health Visitors.

Leipzig Spring Fair

The Leipzig Spring Fair opens on February 28 and remains open for the Sample Fair until March 5 and for the Engineering and Building Fair until March 8.

Appliances used in chemical practice and applied chemistry include many machines and apparatus used in the production of foodstuffs. These include dairies, preserve factories, plain and fancy bakeries, chocolate and confectionery industries, from the preparation of the raw materials to the finished product packed ready for sale. Everywhere, and especially in the foodstuffs and luxury article fair, the visitor will encounter the application of the principle: Economy and above all the use of raw materials produced at home.

Mr. H. H. H. Munro.

H. H. H. Munro, New Managing Director of Dewey and Almy

Mr. H. H. H. Munro has recently arrived in England to act as managing director to Dewey and Almy, Ltd., London, replacing Mr. A. A. Maytham, who has retired. Mr. Munro, who went to school at Westminster and Christ Church, Oxford, subsequently specialised in electrical engineering, obtaining his degree from Faraday House, London.

In preparation for his new position, Mr. Munro has just spent almost a year in America. During this time he visited all the Dewey and Almy Co. plants both in the United States and Canada, as well as visiting and studying the American canning and can-making methods in the more important parts all over the country. He comes back to England with many interesting observations on the various packing and canning problems and the way in which they are handled.

Mr. Ian Samuel Osborn

We deeply regret to announce the death, on December 19, of Mr. Ian Samuel Osborn, managing director of Samuel Osborn and Co., Ltd., the Sheffield steel manufacturers. Mr. Osborn's death was due to an attack of pneumonia, and he was only 36 years old.

A grandson of the founder, he joined the firm soon after the war, and was made a director in 1927. He was educated at St. Anselm's, a preparatory school at Bakewell, and then went to the Leys School, Cambridge. Later he went to Christ's College, Cambridge, where he took an Honours Degree in Engineering.

Forthcoming Lectures

February 3.—"Lesser Known Constituents of Milk and their Examination." Society of Chemical Industry, Food Group joint meeting with the Society of Public Analysts, at Burlington House, Piccadilly, London, W. 1, at 5.15 and 8 p.m.

February 4.—Lecture, "Chemistry of Ascorbic Acid and its Analogues", by Prof. E. L. Hirst, F.R.S. Society of Chemical Industry, Bristol Section joint meeting with the Chemical Society. The University, Bristol, at 7.30 p.m.

February 15.—Lecture, "Scientific Food Preparation", by Dr. L. H. Lampitt. Society of Chemical Industry, Yorkshire Section. Invitation of Institute of Chemistry.

February 16.—Symposium of papers and informal discussion on "Bacteria in Frozen Vegetables; Moulds in Timber". British Association of Refrigeration at 6.30 p.m. British Industries House Club, British Industries House, Marble Arch, London, W.

February 24.—Lecture, "Some Aspects of Modern Analytical Chemistry", by Dr. J. J. Fox, O.B.E., F.I.C., in the Chemical Lecture Theatre, University, Liverpool, at 6 p.m.

▼ ▼ ▼

Mr. Sidney Rogerson, who has been the public liaison officer of Imperial Chemical Industries, Ltd., for the past six years, has been appointed publicity manager of the company.

▼ ▼ ▼

Mr. E. F. Rose, formerly joint managing director of Maconochie Bros., Ltd., has joined Tyne Brand Products, Ltd., of North Shields, to further the firm's interests in London and the South of England.

▼ ▼ ▼

Rex Campbell and Co., Ltd., of 7, Idol Lane, London, E.C. 3, announce that Mr. Kenneth S. Burch has been elected Technical Director of their Company and Mr. Albert C. Garnham has been appointed Secretary.

Major F. H. Millman, superintendent of Spitalfields Market, London, retired on December 29, after occupying that post for 16 years. He is a brother of Mr. H. W. G. Millman, the equally well-known superintendent of Smithfield Market, and is known to every dealer and almost every porter at Spitalfields. He has been in charge since the Corporation of the City of London took it over in 1920. In 1912 he commenced his service with the Corporation, when he was appointed superintendent of the Foreign Cattle Market, Deptford.

The Annual Sales Convention and Dinner of Messrs. Walworth, Ltd., at which Mr. V. L. Young, Managing Director, took the Chair, was held on Friday, January 8, at Bridge House. Walworth salesmen, representatives, and departmental heads from the London Head Office were fully represented.

One outstanding feature of the gathering was the number of members who have been associated with the company for so many years—one for 45 years, one for 43 years, and several others of over 40 years' service.

This was followed by a visit to the Saville Theatre.

▼ ▼ ▼

Honeywell-Brown, Ltd., 70, St. Thomas Street, London, S.E. 1, has been established as a factory branch of the Minneapolis-Honeywell Regulator Co. and the Brown Instrument Co., which form the largest automatic control and instrument concern in the world.

The announcement is contained in an attractively designed pamphlet printed in black and silver on cream paper. A list of catalogues and booklets issued by the company is also given. A condensed catalogue dealing with Automatic Controls and Recording Instruments is of the loose-leaf type, each sheet being well illustrated with pictures of various types of instruments.

Vacuum Refrigeration

The system of refrigeration by vacuum is comparatively new in this country. It is entirely different in operation from the usually accepted method of refrigeration. By this system, water (or brine solution) and steam are generally employed, the operation of the plant depending on the principle of lowering the absolute pressure in an evaporator until it is at the pressure equivalent to the required temperature.

It is a basic physical law that if the absolute pressure above the surface of a liquid be lowered until it is less than that of the vapour pressure of the liquid, the liquid will "boil"—*i.e.*, give off vapour until its temperature has fallen to a point where its lowered vapour pressure equals that existing in the evaporator. In the process of "boiling" under these conditions, there being no outside source of heat, the latent heat of vaporisation must of necessity be extracted from the liquid itself, which thus falls in temperature.

It is therefore possible by this method to obtain large quantities of refrigerating medium in a very simple and economic manner.

▼ ▼ ▼

Owing to rapidly increasing business the C. O. Ericsson Engineering Works, Ltd., King's Norton, Birmingham, bakery engineers, are at present making a large extension to their present works and expect this to be completed by March, 1937.

Development in Automatic Packaging Methods

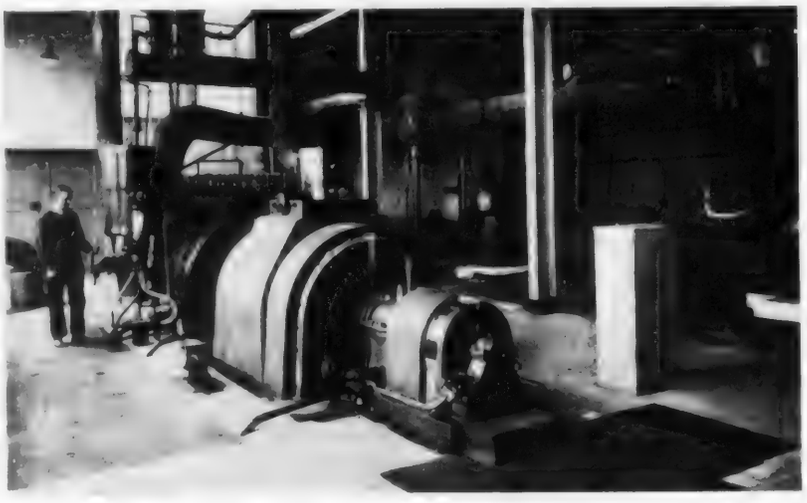
An ingenious powder-filling and paper-wrapping machine which weighs, fills, and delivers a predetermined quantity of powder into its paper wrapper, subsequently folding and sealing the wrapper, has recently been developed and patented by the Sumner Engineering Co., Ltd., of Liverpool.

A completely automatic unit, driven by a fractional h.p. motor through a friction safety device, the machine is simple in construction and operation and represents a practical advancement in the method of packaging small quantities of medicinal powders. From the supply hopper a measured quantity of powder is delivered into a small bucket, accurately weighed, and tipped into the paper wrapper.

Wrappers are fed into the machine in an upright position, picked up singly by rubber grippers, folded once over a metal bar, and held in this position to receive the powder. When filled, the wrapper is folded twice over the powder, the end flaps folded to overlap, and the paper edges locked by a punching and tongueing method. The sealed packets then travel down a chute and are stacked upright ready for counting. Output: 12-30 packets a minute.

▼ ▼ ▼

Bristol's Instrument Co., Ltd., inform us that they have moved to more extensive premises, and that their address is now: Brent Crescent, North Circular Road, West Twyford, London, N.W. 10. (Willesden 3612-3).



A British Thomson-Houston 2,000 kw. maximum rated 3,000 r.p.m., back pressure turbo-alternator (3-phase, 50 cycles, 440 volts, 0·7 power factor), installed in the factory at Bardney, Lincoln, of The Lincolnshire Sugar Co., Ltd. A similar B.T.H. turbo-alternator rated 1,500 kw. has also recently been installed in the Brigg factory of Second Lincolnshire Sugar Co., Ltd.

Filling, Closing and Mixing Machines

E. Cowles, Ltd., of Hounslow, Middlesex, have published a sectional catalogue of their filling, closing, mixing, and moulding machines, and belt and chain conveyors. The machines are supplied in many different designs and specifications. For example, an automatic machine for filling collapsible tubes carries out the operations of feeding the tubes into holders, cap tightening, cleaning, filling, closing, crimping, and coding; other types of this machine being adapted for semi-automatic action, have worm feed and agitator, are designed for heavy products, and for filling containers of various sizes. Separate machines are available for the operations of collapsible tube crimping and closing respectively. Of special interest is a new type of power-operated filling machine, fitted with worm feed and agitator, for filling thick pastes, creams, etc. Among the company's mixing machines, the horizontal mixer and kneader is of special interest. It is specially adapted for mixing powders and liquids of a wide range, the mixing operation being carried out by twin propellors of special shape rotating in opposite directions.

▼ ▼ ▼

Owing to business expansion, Messrs. Maconochie Bros., Ltd., have opened new offices at Sackville House, Fenchurch Street, London, E.C. Orders will continue to be dealt with at the factory in West Ferry Road, Millwall, London, E. 14, where the company was founded over fifty years ago.

Planned Lighting

The efficiency of a worker engaged in any skilled work, and consequently his value to the organisation which employs him, is largely determined by the kind of artificial lighting employed. Many firms have arrived at the fact that the cost of providing and maintaining a system of efficiently planned lighting was insignificant when compared with the increase of profitable output which it provided and encouraged. The Benjamin Electric, Ltd., have applied many years' specialised experience to this question, and are ready to prepare lighting schemes for any works however great or small.

Peerless Move to New Premises

The Peerless Electrical Manufacturing Co., Ltd., have moved from Stanhope House, 320-324, Euston Road, London, N.W. 1, to more extensive premises at Hendon. These include a two-storey office block and works all in one building.

Actual manufacture of their machines will, of course, still be carried on at Westwood Works, Peterborough. Their new address is Carlisle Road, The Hyde, Hendon, N.W. 9.

▼ ▼ ▼

The Alsop Engineering Corporation has moved to a new factory in Milldale, Conn., but is retaining offices, showrooms, and a service department in New York at 17, West 60th Street.

Box Type Comparator

The phosphatase test for the detection of raw or insufficiently heated milk in pasteurised milk depends on the detection of the enzyme, phosphatase, which is always present in raw milk but is destroyed at the temperature necessary for efficient pasteurisation. When milk containing phosphatase is incubated with disodium phenyl-phosphate, free phenol is liberated and the quantity so liberated, which may be determined by a colorimetric method, is an approximate measure of the phosphatase present in the milk. When the test is carried out under standardised conditions a pale blue colour is produced which in the absence of phosphatase does not exceed a certain value. The Lovibond Box Type Comparator placed on the market by the Tintometer, Ltd., is a small device for making this test.

Refrigerators

Vitalaire air-conditioned ice refrigerators are to be introduced in this country during 1937. They are said to give constant, automatic, low temperature, proper moisture, complete circulation of washed air and thorough ventilation so that food is retained in a fresh and wholesome state. These refrigerators have specially designed ice and food compartments as well as patented grid and air-conditioning features to give uniformly even refrigeration over four to seven days with one good icing. They are made by the Ice Cooling Appliance Corporation, Morrison, Ill., U.S.A.

Air Conditioning

The "Germstroyd" electric and portable air conditioner is made by Germstroyd Products, Ltd., Attneave Street, London, W.C. 1. The function of the machine is to balance up the dry, raw air of the room with a sufficient amount of water to make the dry air healthy. It atomises, circulates, and washes the air by drawing it through a latticed screen grating at the top and is passed through a film of water to which is added a proportion of "Germstroyd" essence.

▼ ▼ ▼

A number of power and steam operated vacuum pumps have been supplied by Joseph Evans and Sons (Wolverhampton), Ltd., during the past twelve months to manufacturers both in this country and abroad for use in connection with the production of preserved fruits, milk products, and patent food, etc.

A tunnel dryer and conditioner with circulating fans supplied to a bakery for drying patent bread by Musgrave and Co., Ltd., Belfast.

TRADE LITERATURE RECEIVED

Ice-Cream Brickette Machine

We have received from the Benhil Machinery Co., Ltd., 340, Upper Street, London, N.1, a pamphlet describing their automatic ice-cream brickette cutting and wrapping machine. The ice-cream is taken in the form of a long bar which is inserted vertically into the sloping hopper. A brick is then cut automatically from the bottom of the bar, transferred to the wrapping station and fully wrapped, with the end flaps being folded over, into a wrapping paper taken from a reel. The temperature at which the ice-cream is best worked is about −10° F. and the speed of the machine about 60 packets per minute.

New Laboratory Colloid Mill

The Chemical Publishing Co. of New York, Inc., have issued a leaflet describing their Gaulin laboratory colloid mill which operates from a ½ h.p. motor and develops a rotor speed of more than 10,000 peripheral feet per minute. It is said to have the following advantages over other colloid laboratory mills: the treating gap is adjustable by means of a dial calibrated in 1,000ths of an inch, it is water-cooled, non-foaming, has a non-seizing rotor, and is very easily cleaned. The Gaulin mill is suitable for making emulsions and dispersions of small particle size and good stability, for extracting crude drugs, seeds, etc.

Stelcon Anchor Steel Plates

A new folder has been issued by Stelcon (Industrial Floors), Ltd., giving particulars of this type of flooring, which is made to withstand the heavy usage which flooring has to undergo in many factories and works. The booklet is well illustrated with pictures of Stelcon floors laid down in different types of works.

Sternol, Ltd.

To mark the fiftieth birthday of the company, Sternol, Ltd., has issued a booklet, *The House of Sternol*, 1886-1936. The booklet, which is well produced throughout, gives a short account of the history of the company, and a number of good illustrations showing the head office, some heads of staff, the works, laboratories, storage depôts, etc.

The Nickel Industry in 1936

This annual survey of the nickel industry by Robert C. Stanley, President of the International Nickel Company of Canada, Ltd., states that statistics for the first ten months of 1936 indicate that the current year will establish new records for the nickel industry in the volume and diversification of world consumption. The section devoted to Foods and Beverages states that a majority of the ferrous and non-ferrous nickel alloys, from Ni-Resist and stainless steel on one hand to monel and inconel on the other, are now being used in food and beverage industries. A development of the year has been the rapid increase in consumption of nickel-silvers in dairy equipment.

The food and beverage industries, taken together, are an outstanding contributor to the consumption of nickel cast-irons. Monel and stainless steel are used for the construction of bars, ice-cream cabinets, and dispensing equipment. A newly designed meat chopper has a cylinder of grey cast-iron containing 20 per cent. of nickel. The drive is through helical gears of nickel-chromium steel.

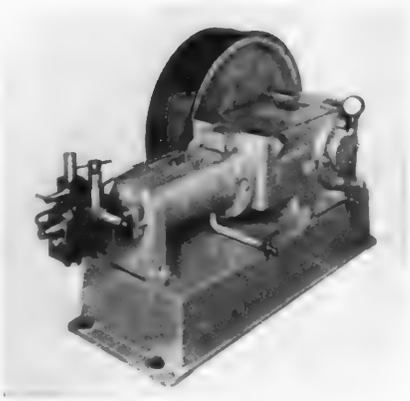
"Chemicals by Glyco"

The latest edition of *Chemicals by Glyco*, published by the Glyco Products Co., 148, Lafayette Street, New York, contains a number of interesting additions. In particular, we note the special formulæ section where suggested formulæ are given of interest to many different industries. An innovation which should prove of value to chemists and technicians is the policy of supplying special assortments of chemicals according to classification. For instance, Assortment A consists of the various emulsifying agents manufactured by the Glyco Products Co., Inc. Thus, if a chemist is working on an emulsion problem, he will have readily accessible a series of emulsifying agents which he can easily try for his particular problem.

Copies of the catalogue can be obtained gratis by any chemist or technician on application to the Glyco Products Co., Inc.

▼ ▼ ▼

L. A. Mitchell, Ltd., Manchester, have published a number of leaflets describing and illustrating their fluid mixers and stirrers, drying plant, and chemical and process plant. Of special interest are the illustrations of drying stoves for drugs, granular substances, etc., continuous rocking cradle crystalliser, rotary and film dryers, and electrically driven mixers and stirrers.



This new 100-gallon model of the Impulsor Emulsifier, marketed by the Improved Emulsification Process Co., Ltd., is the result of a year's testing under actual shop and factory conditions.

Silent running has been achieved, and for operating the Impulsor at its maximum pressure of 3,500 lbs. per square inch a 5 h.p. motor is sufficient.

Burgoyne Burbidges in Colour

All front covers should be attractive. They should invite inspection of the contents whatever they may be. Of course, there are various ways of doing this. Burgoyne and Burbridges and Co., Ltd., achieve the desired result for their new price list with a multi-coloured front of prints in their natural colourings. Inside there are prices of fruit and soluble essences, essential oils, flavourings, colourings, chemicals and sundries, of aerated and mineral waters, bakery, confectionery, cordials, ice-cream, etc., and the lay-out and printing of the interior lives up to the expectation of the cover.

Fifty Years of Business Service

Paragon Check Books, familiar on all retail counters, have attained their fiftieth year of service in the business of the country, and Lamson Paragon Supply Company have accordingly issued an informative history of the Paragon enterprise over this period.

The company's brochure, "A Narrative of Fifty Years", gives an interesting and very well-illustrated account of the evolution of the industry in this country and across the Atlantic in Canada and the U.S.A., and of its development by Paragon throughout the rest of the world, including the Empire, the Continent of Europe, South America, and the Far East.

▼ ▼ ▼

The telephone number of the Peerless Electrical Mfg. Co., Ltd., 320-4, Euston Road, London, N.W. 1, has been changed to Euston 3011.

The Armstrong Textometer for determining the firmness of the flesh of canned salmon.

EXAMINATION

of

CANNED SALMON

New Instruments for testing Tenderness and Colour

The Colorimeter specially designed for estimating the colour of canned salmon.

IT has been the practice of the Canadian Government within recent years to inspect all canned salmon before permitting its sale. For example, firmness of the fish is judged by removing it from the can and crumbling it between the fingers. Needless to say, firmness is difficult to assess by this means and disagreement often arises.

The Canadian Government has realised that the method of inspection leaves much to be desired, and the Department of Fisheries, Vancouver, B.C., has investigated means for measuring, accurately and rapidly, quality characteristics of canned salmon, such as tenderness and colour of flesh.

Working in conjunction with the Norman L. Armstrong Company of Vancouver, the Department has developed an instrument which permits determinations of tenderness to be carried out rapidly and which has been found very valuable in this inspection.

The Textometer

The instrument, known as the Textometer, consists of a levelling platform, on which an opened can of salmon is placed, and a special "head," which is then lowered to contact with the fish. The head carries a set of twelve needles which are allowed to rest on, and penetrate, the flesh for five seconds. At the end of this period the depth to which the needles have penetrated is read off on the scale, the value obtained varying inversely as the firmness of the fish.

The accuracy of the apparatus is within 10 to 15 per cent. on any one can (much closer when several cans of the same lot are tested and averaged) and tests may be performed very rapidly.

Colour Testing

The colour of canned salmon, which is made up of various intensities and proportions of red and yellow tints, can be accurately determined by the colorimeter made by the Norman L. Armstrong Company. The fish is transferred from the can to a small receptacle, which is placed on the platform on the left-hand side of the colorimeter. The receptacle is spun and, while spinning, the colour is compared directly with standard Lovibond tints contained in the disc on the right of the instrument.

The advantages claimed by these two instruments are numerous. By means of the Textometer firmness can be gauged, definitely by number, on salmon as packed in the canneries and lots segregated if necessary on this basis, while all disputes can be settled by means of a positive test. The colour of salmon is one of the best buying guides used by the ultimate consumer and, by the above colorimeter which rules out the personal equation, this can be described simply by a numerical designation—*e.g.*, 8/10, which means 4 red and 5 yellow units.

Both these instruments are supplied by A. Gallenkamp and Co., Ltd., 17-29, Sun Street, and 1-3, Clifton Street, Finsbury Square, E.C. 2, who have the exclusive rights of sale anywhere outside of Canada and the United States.

CANADIAN FISHERIES STATION PROGRESS REPORT

PROGRESS Report No. 30, issued by the Pacific Biological Station and the Pacific Fisheries Experimental Station, British Columbia, deals with work done on the following subjects: Summer Herring from Klemtu, the Hooked Snout in the Salmonidae, the Free Oil Content of Canned Salmon, Ocean Currents.

FLAVOUR & CREAMING POWER of MILK

The Effect of Temperature of Heating Medium and Type of Pasteuriser

By J. C. Marquardt, Associate in Research of the New York State Agricultural Experiment Station, Geneva, N.Y.

A study has been completed correlating the flavour and creaming power of pasteurised milk with the temperature of the heating medium. The study includes results obtained with glass and steel linings commonly used in the construction of pasteurising vats. The study included trials with low and high fat content milk. Milk of low and high sanitary quality was also used. It was not possible to correlate a slightly cooked flavour of pasteurised milk with the presence or absence of film in the vat. Laboratory experiments demonstrated that momentarily over-heating milk to a temperature as high as 170° F. did not impart a heated flavour to the milk.

THERE HAS been much speculation concerning the influence of the temperature of the heating medium on pasteurised milk. It has been generally advocated that a very small differential in temperature between the heating medium and the heated product should be used, mainly to avoid heated flavours. The importance of this temperature differential, however, has been minimised by some investigators and machinery manufacturers. The literature contains limited information on this subject. It is for this reason that a project was inaugurated with the specific aim of establishing temperature differentials and physical constants for the rate of heat transfer through two materials used in the manufacture of pasteurising vats.* The facts gathered together in the citation referred to assisted in the solution of the problem dealing with the desirable temperature of the heating medium in the pasteurisation of milk. It is proposed herein to present and interpret data so that the true conditions dealing with the influence of temperature and velocity of the heating medium as related to the flavour and creaming power of pasteurised milk will be better understood.

Procedure and Methods

Two specially constructed experimental pasteurisers were utilised. These were comparable in every respect except for the lining, which was made of two different substances used in the comparisons. The two 30-gal. pasteurisers were insulated with 1 inch of cork and covered with galvanised iron. Each jacket was fitted with water, steam and brine connections. An interchangeable pump with a capacity for circulating 56 lb. of water per minute provided circulation within the jacket whenever it was desired. Thermometers were inserted in the jackets so that a record of the temperature of the in-going and out-going water, steam or brine could be determined. The first pasteuriser was lined with stainless steel, known as 18-8 alloy steel. The steel had a uniform thickness of 3/32 inch. The second pasteuriser was lined with glass-coated steel. The steel was $\frac{1}{8}$ inch in thickness and was covered with three coats of enamel. Both tanks had a heating area of 14·9 square feet or 0·50 square foot per gallon of milk. Each pasteuriser was equipped with a vertical 3-blade propeller agitator. This agitator was located 5 inches from the side, at a distance of 5 inches from the bottom of the tank. Each agitator was attached to the bottom end of a 1-inch shaft. Each agitator was adjustable to 4 pulleys, which allowed agitation rates of 56, 110, 172 and 218 r.p.m. The diameters of the pasteurisers were 20 inches.

A spray-type vat used in this study had a capacity of 125 gal. It was lined with stainless steel. The metal was the same as used in the previously described steel-lined vat. The steel had a uniform thickness of 3/32 inch. This vat was 5 feet long, $19\frac{7}{8}$ inches wide, and the depth ranged from 26 to 28 inches. The vat had 27·3 square feet of heating surface. There was 0·265 square foot of heating surface per gallon when the vat was filled to capacity. The capacity of the vat is given when filled to within 3 inches of the top of the lining. The water for heating was circulated with an ejector having a rated capacity of 290 lb. per minute. The jacket was also supplied with a special steam inlet. This enabled manipulation when various heating temperatures were used. Milk was pasteurised in the vats with water or steam as the heating medium. The water temperatures employed were 180°, 200° and 210° F. Flowing steam at 210° F. and steam at 220° F. at $1\frac{1}{2}$-lb. pressure were also used in the tests.

* Marquardt, J. C., Pheteplace, W. D., and Dahlberg, A. C., "Heat Transfer Through Stainless Steel and Glass-Lined Steel in Dairy Pasteurisers". New York Agr. Exp. Sta. Tech. Bull. No. 211, 1933.

The majority of the trials were conducted with milk that contained 4·5 to 5·4 per cent. of fat. Heating and cooling periods were recorded. For each trial samples of the raw and pasteurised milk were taken. Three pasteurisation samples were taken; one was surface tubular cooled, a vat cooled sample, and one was partially cooled in the vat and finished on the surface tubular cooler. All samples were judged by three persons. After 2, 4, 24, 48 and, in some cases, 72 hour ageing at 33° to 40° F., the samples were warmed from 70° to 90° for scoring. Five bottles of each sample were taken. The milk judging was done independently, only on a limited number of occasions did two or more judges occupy the sampling room at the same time. The judges were asked to use the following terms to designate the extent of the heated flavour in the milk: raw, pasteurised, slightly cooked, cooked, and badly cooked. They were also asked to give any other characteristic flavour which was present in the milk. A sample judged to be pasteurised might show no indication of a heated flavour, yet the judges would realise that it was not raw.

A limited series was made with milk containing less than 4 per cent. of fat, and of lower sanitary quality than the station milk. This was done in an effort to learn if all types of milk reacted in like manner. Check-ups in commercial plants were also made before concluding the study. Samples of the series referred to above were placed in 100 c.c. cylinders, and cream layer volumes were noted after 2, 4 and 24 hours of creaming at a temperature ranging from 33° to 40° F.

Finally, the results were correlated in an attempt to establish temperature and velocity limits for successfully pasteurising milk. Pasteurising to develop a pleasant flavour without a noticeable heated flavour and to prevent cream layer destruction were the two guides in establishing the limits mentioned.

RESULTS

Effect of Heating Medium Temperatures upon the Flavour of the Milk

Studying the data it immediately became apparent that the observations of the three judges were consistent. It was further noted from the 636 independent opinions given in one series that with this large number compensating factors eliminated the need for summarising independently the judges' observations. It was desirable, however, in tabulating and studying the data to separate the individual opinions. Table I. shows, in percentages, the relative accuracy of the three judges in properly designating the samples as being raw or pasteurised. It supports the contention that the judges' opinions agree quite well and can be dealt with collectively. In the majority of trials each judge was able to pick the raw from the pasteurised samples and greatest variations in judgment were secured with heating water at 180° F.

The effect of the temperature of the heating medium upon the milk is summarised in Table II. The results were obtained in the two experimental vats. Twenty gallons of milk were used for each trial, and it was agitated with the agitator revolving 172 r.p.m. Table II. indicates that it is slightly more difficult to detect pasteurisation in a glass lining than in a stainless steel lining when the heating medium is steam. It shows, further, a general trend to detect pasteurisation more readily as higher temperatures of the heating medium are used. Steam under pressure in the glass-lined vat produced results that did not follow this general trend. Table I. shows that this trend was consistent for the three judges' observations. No explanation is available for this irregularity. Further analysis of the data will be made before final deductions are drawn.

The summary of data up to this point is very general and indicates trends which are not very pronounced. An

TABLE I.—ABILITY OF EACH JUDGE TO DESIGNATE THE SAMPLES PROPERLY AS BEING RAW OR PASTEURISED.

Heating Medium.		*Percentage of Samples Properly Designated.*								
Kind.	*Temperature, °F.*	*Judge A.*		*Judge B.*		*Judge C.*		*Averages.*		
		Raw.	*Pasteurised.**	*Raw.*	*Pasteurised.*	*Raw.*	*Pasteurised.*	*Raw.*	*Pasteurised.*	*All Samples.*
				Glass-lined Vat.						
Water ..	180	25	75	100	100	33	100	52·6	91·6	72·1
Water ..	200	75	75	100	93	100	100	91·6	89·3	90·4
Water ..	210	80	100	100	100	83	100	87·6	100·0	93·8
Steam ..	210	66	100	100	100	100	100	88·6	100·0	94·3
Steam ..	220†	100	73	100	40	100	80	100·0	64·3	82·1
				Steel-lined Vat.						
Water ..	180	57	71	76	95	83	100	72·0	88·6	80·3
Water ..	200	66	100	100	100	100	100	88·6	100·0	94·3
Water ..	210	100	100	100	66	66	100	88·6	88·6	88·6
Steam ..	210	50	100	100	100	100	100	83·3	100·0	91·6
Steam ..	220	100	100	66	100	100	100	88·6	100·0	94·3
Average ..		71·9	89·4	94·2	89·4	86·5	98·0	84·2	92·2	88·2

* All samples designated as pasteurised were heated to 143½° F. and held for 30 minutes.
† Steam temperatures of 220° F. were used under 1¼ to 2¼ pounds of pressure.

TABLE II.—EFFECT OF TEMPERATURE OF HEATING MEDIUM UPON THE FLAVOUR OF PASTEURISED MILK.*

Heating Medium.		Number of Samples.			
		Actual.		Correctly Selected as :	
Kind.	Temperature, °F.	Raw.	Pasteurised.	Raw.	Pasteurised.
Glass-lined Vat.					
Water ...	180	16	46	9	43
Water ...	200	15	46	14	42
Water ...	210	14	41	12	41
Steam ...	210	7	21	6	21
Steam ...	220†	13	40	13	27
Steel-lined Vat.					
Water ...	180	20	63	14	57
Water ...	200	9	27	8	27
Water ...	210	9	27	6	24
Steam ...	210	8	24	7	24
Steam ...	220	8	24	7	24

* In each trial 20 gallons of milk were heated, the agitator revolving at 172 R.P.M.
† Steam temperatures of 220° F. were used under 1¼ to 2¼ pounds of pressure.

attempt to establish marked differences in flavour resulted in comparing steam under pressure with water at 180° F. as a heating medium with the agitator revolving 56 and 172 r.p.m. in the glass-lined vat. These data, summarised in Table III., only further general trends, as the results are quite uniform.

TABLE III.—EFFECT OF VARIATIONS IN THE HEATING MEDIUM TEMPERATURE AND THE RATE OF AGITATION OF MILK HEATED IN THE GLASS-LINED VAT UPON THE JUDGES ABILITY TO DESIGNATE THE SAMPLES PROPERLY.

Heating Medium.			Percentage of Samples Properly Designated.		
		R. P. M.			
Kind.	Temperature, °F.		Raw.	Pasteurised.	Average.
Water ...	180	172	56·2	93·4	74·8
Steam ...	220	172	100·0	67·5	83·7
Steam ...	220*	56	61·9	100·0	80·9

* Steam temperatures of 220° F. were used under 1¼ to 2¼ pounds of pressure.

The experiment was repeated in the steel-lined vat with the heating water at 180° and 210°. Both runs were judged at the same time. The results are presented in Table IV. Incidentally the series reported in this table is a perfect correlation when considered as series or individual opinions. These data show a rather positive distinction between the raw and pasteurised milk. The apparentness of this trend can be re-checked in Tables I. and II.

Considering the difficulty of imparting cooked flavours to milk in the heating trials with the two 30-gal. vats, the study was extended to the spray vat, as this vat had a much greater coefficient of heat transfer. In the spray vat trials water at 160°, 180° and 200° F. was used for heating. Obviously steam could not be used because of the type of construction. The spray vat series are tabulated as part of Table V. This part of the table indicated

TABLE V.—EFFECT OF HEATING MEDIUM TEMPERATURE UPON THE FLAVOUR OF THE PASTEURISED MILK.*

Heating Medium.		Total Number of Samples.	Number of Pasteurised Samples with :			
Kind.	Temperature, °F.		Cooked Flavour.	Slightly Cooked Flavour.	Pasteurised Flavour.	Raw Flavour.
Glass-lined Vat.						
Water	180	46	0	0	43	3
Water	200	46	0	0	42	4
Water	210	41	0	0	41	0
Steam	210	21	0	0	21	0
Steam	220	40	0	0	27	13
Steel-lined Vat.						
Water	180	63	0	0	56	6
Water	200	27	0	0	27	0
Water	210	27	3	0	21	3
Steam	210	24	5	15	5	0
Steam	220	24	6	9	9	0
Spray Vat.						
Water	160	18	0	0	18	0
Water	180	81	0	0	79	2
Water	200	27	0	0	27	0

* The data on the raw samples are not included as they were rarely considered to be pasteurised.

that it was relatively easy to detect the raw and pasteurised samples. The judges agreed even better than on previous samples. This condition prevailed in spite of the fact that a substitute judge was called upon to help judge the series. For the first time the detailed comments of the judges are given, as these comments have a special significance in establishing the conclusions. In using

TABLE IV.—RESULTS OBTAINED IN MAKING A DIRECT COMPARISON OF SERIES HEATED IN A STAINLESS STEEL VAT WITH THE HEATING MEDIUM AT LOW AND HIGH TEMPERATURES.*

Heating Medium.		Percentage of Samples Properly Designated.								
		Judge A.		Judge B.		Judge C.		Averages.		
Kind.	Temperature, °F.	Raw.	Pasteurised.	Raw.	Pasteurised.	Raw.	Pasteurised.	Raw.	Pasteurised.	Raw and Pasteurised.
Water ..	180	66	100	100	100	100	100	88·6	100	94·3
Water ..	210	66	100	100	100	100	100	88·6	100	94·3
Average ..		66	100	100	100	100	100	88·6	100	94·3

* In this series the 180° and 210° F. water was used on two consecutive batches run the same day. This allowed for direct comparisons of the two temperatures of the heating medium.

heating medium ranging from 160° to 200° F. water the resulting pasteurised milk failed in all cases to have a flavour other than pasteurised. There was not the least indication of a slightly cooked flavour. This fact should not, however, encourage using water above 180° F. in the spray vat. Using 160° F. water resulted in heating a vat full of milk in 27½ minutes. Using water at 180° F. reduced this time by 4 to 5 minutes in all trials. Higher temperatures caused excessive strain on the vat due to an injector circulator, and have little practical value.

The detailed comments of the judges for milk pasteurised in the experimental vats are also presented in Table V. to illustrate that the temperature of the heating medium did not markedly affect the flavour of the milk. In the trials with the three vats no samples were designated as badly cooked. The table reveals that a range of heating medium from water at 180° to steam at 220° F., and under 1¼ lb. of pressure, can be used in a glass-lined vat without affecting the flavour of the milk. The table reveals further that water at a temperature of 180° or 200° F. can be used in either steel-lined vat without affecting the flavour of the milk.

In this work the heating periods and temperatures were recorded as a means of checking the accuracy of procedures. These data are presented in Fig. 1. They afford the reader a chance to check rates of heating which varied from 9 to 27 minutes to raise a vat of milk to 143½° F.

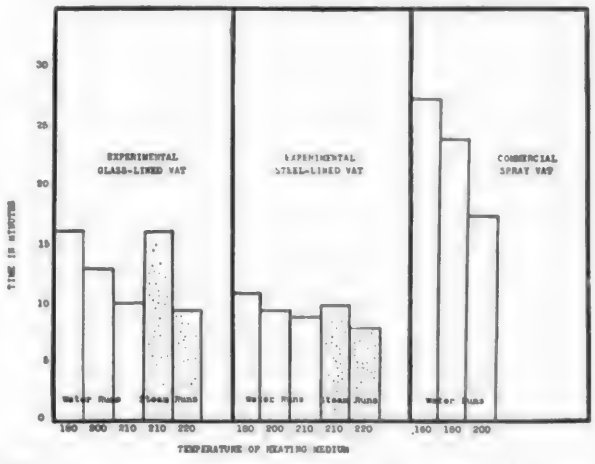


FIG. 1.—A graphic summation of the time required to heat milk from 40° to 143½° F.

Effect of Heating Medium Temperatures upon the Creaming of Milk

A total of 770 cream layer readings were made to check the influence of the temperature of the heating medium upon the creaming properties of the milk. Previously described technique* was employed. Samples were placed in 100 c.c. cylinders and cream layer volumes were observed after 2, 4, and 24 hour intervals. After determining the fat content of the milk the cream layer ratio was computed. For each trial a raw sample, and pasteurised samples surface tubular, vat, and vat and coil cooled, were studied in duplicate to determine their creaming power. A sample of the raw milk heated to 98° F. was regarded as the true control. It was also found desirable to take a sample at the beginning and close of the heating period.

The summation of the above data showed that 2, 4, and 24 hour samples followed similar trends. For this reason only the 24-hour ratios are presented in Table VI. The values show that the temperature and type of heating medium have no influence on the creaming power of the milk under conditions encountered in these studies. The values obtained with 180° F. in the stainless steel vat are slightly out of line due to over-heating during pasteurisation. However, the data are included in the table as the deviations are slight.

As the results obtained with the rich, high sanitary quality station milk did not agree with what the industry has regarded to be true relating to flavour and creaming as influenced by the heating medium, this study was extended to include milk of low sanitary quality containing 4 per cent. or less of milk fat. The findings with low-test, low-quality milk are recorded in Table VII. The results are similar to those secured from high-test, high-quality milk. Heating with steam at 210° or at 220°

* Marquardt, J. C., and Dahlberg, A. C., "The Volume of the Cream Layer Forming on Holstein and Jersey Milk". *Jour. of Dairy Science*, vol. 11, No. 3, pp. 409-419, 1928.

TABLE VI.—THE EFFECT OF TEMPERATURE OF THE HEATING MEDIUM UPON THE FLAVOUR AND CREAMING POWER OF LOW FAT CONTENT MILK OF POOR SANITARY QUALITY.

Heating Medium.				*Number of Pasteurised Samples.*			*Cream Layer Ratio, 24-Hour Sample.**				
Kind.	*Temperature, °F.*	*R. P. M.*	*Total Number of Samples.*	*Slightly Cooked Flavour.*	*Pasteurised Flavour.*	*Mistaken for Raw Flavour.*	*Raw.*	*98° F.*	*Surface Tubular Cooled.*	*Vat Cooled.*	*Vat and Surface Tubular Cooled.*
				Glass-lined Vat.							
Steam ..	210	56	27	0	27	0	4·1	4·1	4·1	4·1	4·1
Steam ..	220	56	27	0	24	3	4·0	4·0	4·0	4·0	4·0
				Steel-lined Vat.							
Steam ..	210	172	27	5	22	0	4·2	4·0	4·1	4·1	4·1
Steam ..	220	172	27	6	21	0	4·0	4·0	4·0	4·0	4·0

* The cream layer ratio is obtained by dividing the percentage of cream layer formed by the fat content of the milk. Thus, milk showing 16·4 per cent. cream layer and testing 4·0 per cent. fat would have a cream layer ratio of 4·1.

TABLE VII.—EFFECT OF TEMPERATURE AND KIND OF HEATING MEDIUM UPON THE CREAMING POWER OF MILK.

Heating Medium.				Cream Layer Ratios, 24-Hour Sample.*						
Kind.	Temperature, °F.	R. P. M.	Raw.	98° F.	143½° F.	Held 30 Minutes.	Surface Tubular Cooled.	Vat Cooled.	Surface Tubular and Vat Cooled.
Glass-lined Vat.									
Water	180	172	4·3	4·2	4·2	4·0	4·0	4·0	4·0
Water	200	172	4·3	4·1	4·0	4·1	4·1	4·1	4·1
Water	210	172	4·0	4·1	4·1	4·0	4·1	4·1	4·0
Steam	210	172	4·5	4·2	4·1	4·1	4·1	4·1	4·1
Steam	220	172	4·3	4·1	4·1	4·0	4·1	4·1	4·1
Steam	220	56	4·2	4·1	4·1	4·1	4·1	4·1	4·1
Steel-lined Vat.									
Water	180	172	4·5	4·1	4·1	3·8	3·7	3·7	3·7
Water	200	172	4·0	4·0	4·0	4·0	4·0	4·0	4·0
Water	210	172	4·1	4·1	4·1	4·1	4·1	4·1	4·1
Steam	210	172	4·0	4·1	4·1	4·0	4·0	3·9	4·0
Steam	220	172	4·3	4·0	4·0	4·0	3·9	3·9	4·0
Spray Vat.									
Water	160	—	4·8	4·0	4·0	4·0	4·0	4·0	4·0

* The cream layer ratio is obtained by dividing the percentage of cream layer formed by the fat content of the milk. Thus, milk showing 16·4 per cent. cream layer and testing 4·0 per cent. fat would have a cream layer ratio of 4·1.

under 1¼ lb. pressure failed to impart even a slightly cooked flavour to the milk pasteurised in the glass-lined vat. This condition held even though the milk was stirred with the agitator revolving as slow as 56 r.p.m. The data again established the probability of imparting cooked flavour by heating with steam in the stainless steel vat. Creaming results with poor quality milk were like those obtained with good milk. The findings of this investigation established that quality and fat content were not factors in causing cooked flavours in pasteurised milk.

Effect of Highly Heating Milk upon its Flavour

At this point a deviation from the project was considered. An attempt was made to determine how high milk could be heated before it developed a cooked flavour, the assumption being that temporary over-heating rather than the heating medium temperature was responsible for a cooked flavour sometimes associated with pasteurised milk. Three lots of milk were heated in the glass-lined pasteuriser to 143°, 148°, 150°, 155°, 157½°, 160°, 162½°, 165°, 167½° and 170° F. and held for 1 minute. The three judges could not detect even a slightly cooked flavour in any of the samples.

The trials were repeated in the glass- and steel-lined vats, and in these trials a heavy film of milk was burned on to the lining before the tests were made. This was accomplished by heating skim milk to 190° F. in the vats, and maintaining the steam pressure in the jackets as the skim milk was slowly drained from the vats. This procedure failed to produce slightly cooked flavours in subsequently pasteurised milk at 170° F. for a holding period of 1 minute. The results tended to discourage the idea that momentary over-heating of milk caused slightly cooked flavours. It also discounted the idea that film or deposits on the vat lining causes cooked flavours. These experiments, however, are far too meagre for definite conclusions, as observations ought to be made extensively in commercial plants.

Effect of Cooling Methods upon the Pasteurised Milk

The method of cooling pasteurised milk was studied. The summary of the milk flavour after 24 hours ageing at 33° to 40° F. appears in Table VIII. A comparison of 1,014 flavour determinations indicates that cooling pasteurised milk directly over a surface tubular cooler, using water in the upper tubes and brine in the lower part, is not as satisfactory as pre-cooling in the vat before passing the milk over the coils. It is merely a tendency, however, which is often true.

TABLE VIII.—EFFECT OF THE METHOD OF COOLING UPON THE FLAVOUR OF PASTEURISED MILK.

	Effect on Pasteurised Milk when—			
	Raw Milk.	Surface Tubular Cooled.	Vat Cooled.	Vat and Surface Tubular Cooled.
Number of samples	255	253	253	253
Number without flavour defect	225	205	222	221

Further evidence establishing this tendency is supplied in Table IX. The values in this table are obtained from the opinions of the three judges on 2, 24, and 48 hour old samples. The individual opinions and the time intervals for sampling are summarised collectively as the organised data showed uniformity in the opinions at the different intervals although the character of the flavour changed with age. The values in Table IX. show an advantage in vat cooling to 123° or 113° F. over vat cooling or cooling to 133° F. The number of satisfactory samples,

the number designated as excellent, and the number designated as raw though pasteurised establish a slight but positive trend in the manner indicated.

TABLE IX.—EFFECT OF PARTIAL VAT COOLING BEFORE SURFACE TUBULAR COOLING UPON THE FLAVOUR OF PASTEURISED MILK.

Temperature to Which Milk was Vat Cooled, °F.	*Not Cooled.*	133°.	123°.	113°.
Number of samples	51	51	51	51
Number satisfactory	34	35	38	38
Number designated as excellent	2	2	8	8
Number designated as raw ...	4	4	5	5

The results secured in this investigation are somewhat at variance with accepted practice, and it is possible that they may be varied by the conditions of the experiment. It has been clearly demonstrated that a cooked flavour in milk can be produced with certainty only by extreme conditions of heating. Steam under a pound pressure for the glass-lined steel experimental vat, water at 200° F. in the stainless steel-lined experimental vat, or in the stainless steel-lined spray vat, could be used as the heating medium without giving the milk a cooked flavour. Six tests conducted in a commercial plant verified the laboratory results that steam could be used for heating milk in certain types of pasteurisers without producing heated flavours.

In spite of the absence of a cooked flavour the judges were usually successful in differentiating between raw and pasteurised milk by its flavour. In summer, raw milk has a flavour characteristic for the various succulent grasses and plants consumed. A variety of flavours are blended together, yet individual feed flavours are easily recognised. When such milk is pasteurised the intensity of the feed flavours is lessened and the flavours blend to give less variety. None of these feed flavours may be particularly objectionable, yet it is usually possible to select raw from pasteurised milk on this basis. During the ageing of the samples at 34° to 40° F. there is a tendency for the raw samples to become rancid or to show indications of souring even though the acidity is not high. The pasteurised samples tend to develop a cardboard or old storage flavour which is designated by many persons as pasteurised or cooked. It is obvious, however, that such flavour cannot be cooked, as a cooked flavour is most pronounced in the freshly pasteurised milk and tends to disappear with age. In these experiments it often happened that freshly pasteurised milk classed as cooked by the three judges would show no traces of this flavour 24 hours later. In the winter months it is much more difficult to recognise raw milk, as feed flavours of properly fed cows are almost absent. The flavour of the pasteurised winter milk is somewhat milder.

There was a very evident tendency for pasteurised milk cooled in the vat to 115° to 125° F., followed by surface tubular cooling to 40° F., to be slightly better in flavour than when the milk was only surface tubular cooled. Often the vat and tubular cooled milk seemed fresher and the tendency to develop cardboard or storage flavour was decreased. These results were not consistently secured, but in no case were the opposite results secured. No explanation of these observations can be offered. This pre-cooling of pasteurised milk in the vat has other advantages—namely, it gives a break in the holding period on the recording chart, it assists in reducing the formation of milk stone, and makes it easier to wash the vat. The practice is regularly followed in the pasteurisation of the milk supply at this station.

This investigation agrees with other work of this station in showing that the creaming of milk is not affected by the temperature of the heating medium. It appears from these studies that cream layer volumes are impaired at much lower temperatures than those required to "scorch" milk. All degrees of agitation of the milk used in these tests were ample to prevent cooked flavours even with the hottest heating mediums. These results were unexpected, but they agree in general with the other studies herein reported. Apparently the over-heating of the milk film reported in an earlier study was not sufficient to produce cooked flavours. Rapid agitation of milk increases the rate of heat exchange but is of less importance in problems of flavour.

It is believed that these studies clearly show that high temperatures of the heating medium do not necessarily produce cooked flavour in milk. Nevertheless, it is believed that it is not good practice to permit the use of unnecessarily high temperatures. The temperature of heating medium must vary with different equipment, depending upon the construction of the apparatus, type of lining, rate of circulation of the heating medium, etc. It is not possible to set standards for all conditions, and the maximum temperatures which could be used and not produce cooked flavours may be too high or may be satisfactory for a given pasteuriser.

CONCLUSIONS

1. Milk was pasteurised in a glass-lined vat without imparting a cooked flavour with heating water as high as 210° F. or steam at 220° F. under 1¼ lb. of pressure.

2. Milk was pasteurised in a stainless steel-lined vat without imparting a cooked flavour with heating water as high as 200° F.

3. The design and size of the pasteuriser affected the rate of heat transfer, and the temperatures which could be used for the heating medium for both of these factors influence the tendency of milk to assume a cooked flavour.

4. Low and high fat content milk and milk of high and low sanitary quality respond alike when subjected to comparable treatments with the heating medium.

5. The temperature of the heating medium did not affect the creaming properties of the milk.

6. Milk flavours were benefited when vat cooling to 125° F. or below was practised before passing the milk over the cooling coils.

7. It was not possible experimentally to associate slightly cooked flavours in pasteurised milk with the presence of film or scale in the tank. This applied to both steel- and glass-lined tanks.

8. Momentary over-heating of milk did not produce a heated flavour. This condition holds when the over-heated milk reached a temperature of 170° F. and was held at this temperature for 1 minute or less.

INFORMATION and ADVICE

Succade—Sweet Mustard Pickle—Glace Fruits—Curry Sauce—Fillet Herring Paste—Anchovy Paste—Fruit Storage—Vegetable Compounds—Sweet Pickle

Succade

2,071. *Would you please give us information regarding the manufacture of Succade?* (Norway.)

We understand that this product consists of sweetened and spiced fruit pulps. The fruits used are pumpkins and squashed melons. A typical recipe is as follows:

Pumpkin pulp	100 lb.
White sugar	25 ,,
Ground cinnamon	2 oz.
Ground mace	3 ,,
Cayenne	1 drm.

Pumpkin pulp is prepared as follows:

Peel the pumpkins and cut into pieces. Place in cold water and gently boil until soft, then rub through a fine sieve.

Weigh out 100 lb. of pulp and place in steam pan, and add the sugar and spices, and gently boil until quite thick. Colour pale pink, and fill hot at not less than 200° F. Cap at once.

Sweet Mustard Pickle

2,072. *Can you please give us a formula for a sweet mustard pickle?* (Sunderland.)

The following recipe should serve as a basis for experiment:

Vinegar, 16 gr.	45 gal.
Mustard	36 lb.
Gum tragacanth	6 ,,
Curry	3½ ,,
Ground ginger	1 ,,
Table salt	7 ,,
Raw onions	2 ,,
Garlic	½ ,,
Cauliflower	100 cwt.
Chumps	25 lb.
Cutting onions	25 ,,
Small gherkins	15 ,,
White sugar	40 ,,

Cut up the vegetables on a draining table and drain all night. Next day place the vinegar in a steam pan and add the sugar, mustard, curry, ginger, and salt. The gum should be soaked in 6 gal. of the vinegar for 24 hours and then rubbed through a fine hair sieve. Peel and chop the onions and garlic, add to steam pan and bring to the boil. Add the vegetables, stir well and gently simmer for 30 minutes.

Glacé Fruits

2,073. *We are interested in the methods which are employed by the French in the manufacture of glacé fruits, and should be glad if you could assist us.* (South Africa.)

It is assumed that the general methods of preparing glacé fruits are known, and that information only is required upon the particular features of the French process.

Most of the glacé fruits in France are prepared directly from the fresh fruit, that is, there is no preliminary blanching process which is usual in the United States and England. In this way penetration of the sugar syrup is slower, but a more cloudy product results. There are probable advantages, however, in that the texture of the fruits syrupped in the raw condition is superior to partially cooked fruit. The syrupping is done in the usual way, starting with the first syrup of about 35° Balling, and finishing exactly as for crystallised fruits. In order to put the final glaze on the fruit, 40° Bé syrup is prepared, and the crystallised fruit is dipped into it and placed on racks to dry.

Curry Sauce

2,074. *Can you please furnish us with a formula for the manufacture of a curry sauce?* (Adelaide.)

A typical formula is as follows:

Gum tragacanth	2 lb.
Water	4 gal.
Pale malt vinegar (24 gr.)	25 ,,
Table salt	4 lb.
White sugar	20 ,,
Curry powder	20 ,,
Garlic, chopped	2 oz.
Raw onions	2 lb.

Place the gum in 2 gal. of the water to soak for 24 hours. Stir well and add the other 2 gal. of water. Place the vinegar in a steam pan, which should not be made of iron, and add the salt, sugar, onions, and the garlic. Bring to the boil, shut off the steam, and add the rub, which should have been rubbed through a fine-hair sieve. Stir well, add the curry powder, bring to the boil and gently simmer for 15 minutes. Return to the steam pan, fill and cap hot at not less than 180° F. A little colour may be added.

Fillet Herring Paste

2,075. *We have an enquiry for details regarding the manufacture of fillet herring paste, and would appreciate any information you can give us.* (Gloucester.)

The following typical recipes should serve as a basis for experiment:

PROCESS "A"

The fillets, roes and melts, after having been thoroughly cleansed, are put through the finest gauge of mincer, then mixed in mixing machine with oil, spices, and other flavouring substances to the right consistency. The mixture is then run into cans, the top put loosely on and exhausted for 15 minutes at 206° F. The top is then sealed and the can processed for 45 minutes at 230° F. Cochineal may be added to colour, if desired.

PROCESS "B"

The fillets, roes and melts, after having been thoroughly cleansed, are sprinkled with salt and put into an earthenware dish with white vinegar. Bake slowly for 2 hours. Strain off the vinegar. Put through mincer or pound in a mortar. Pass the material through a fine sieve and press into pots, pouring clarified butter on the top of each.

PROCESS "C"

The fillets, roes and melts, after having been thoroughly cleansed, are baked or steamed, put through fine gauge mincer. Place the material in a saucepan with butter (3 oz. of butter to four herrings), mace, pepper and cayenne. Stir and mix thoroughly over fire, and when scalded remove. Allow to cool, and press into pots, pouring clarified butter on the top of each.

Anchovy Paste

2,076. *We should be very much obliged if you could let us have a recipe for the manufacture of anchovy paste.* (Paris.)

A typical recipe is as follows:

Anchovies	112 lb.
Butter	18 ,,
Salt	2½ oz.
White pepper	4 ,,
Curry powder	1 ,,
Ground nutmeg	½ ,,

Colour to suit.

Split and bone the fish. Mix well with other ingredients. Pass through fine mincing machine and fine sieve. Fill into containers and process at 240° F. for about 45 minutes, depending on the size of the pack. If pressure retort is not available, stand in boiling water, raising the temperature to 180° in one hour and to boiling point in another hour.

Fruit Storage

2,077. *I should be glad to receive any information you are able to give with regard to the storage in bulk of fruits, such as dates and figs. I should particularly like to know the most suitable temperatures, and also how long such commodities could be expected to keep in satisfactory condition. The same information would also be welcome in respect of vegetable and fruit oils.* (Sale.)

It is presumed that fresh fruits are referred to.

Fresh dates and figs can be stored in sound condition for short periods of time at 34° F., but the humidity of the storage room should be controlled so that it does not rise above 60°. The condition of the fruit is a very important factor; it should be firm and should tend to be under-ripe. Under suitable conditions it can be kept at 34° F. for as long as four weeks.

With regard to vegetable and fruit oils, the conditions of storage of these will depend on the particular oil in question, since these vary considerably between one fruit or vegetable and another.

In general, however, such oils should be stored in containers which prevent the free access of air and the penetration of light. Also the temperature should be kept as low as possible, but care should be taken to see that it does not fall below the melting point of the oil in question.

Traces of metal, particularly iron and copper, should be carefully avoided, as their presence will accelerate the production of any "off" flavours during storage. Under ideal conditions, as described, it is possible to keep vegetable and fruit oils in sound condition for 12-18 months.

Vegetable Compounds

2,078. *I shall be extremely obliged if you will be so kind as to give me information with respect to the methods of manufacturing vegetable compounds for shortening and cooking.* (Staffs.)

Vegetable shortenings are usually made from mixtures of vegetable oils, such as cotton seed or nut oil, which have been completely hydrogenated.

The hydrogenated oil is then mixed with a little of the refined raw oil to produce shortening. Alternatively, an almost similar product may be obtained by hydrogenating a raw vegetable oil to about 90 per cent. of saturation.

Sweet Pickle

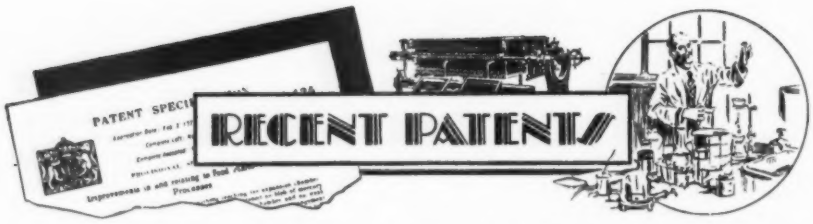
2,079. *Would you please let us have a formula for a sweet pickle?* (Essex.)

Experiments should be made with the following typical formula:

Water	8 gal.
Acetic acid	2 pt.
Sago flour	3½ lb.
Table salt	2 ,,
Curry powder	½ ,,
Turmeric	¼ ,,
Ground ginger	½ ,,
Mustard	4 ,,
White sugar	40 ,,
Caramel	1 ,,
Cauliflower	75 ,,
Chumps	50 ,,
Cutting onions	25 ,,

Place water, sago flour, salt, curry powder, turmeric, ginger, mustard, sugar, colour, and caramel into a steam pan. Chop the vegetables finely. Bring the contents of the steam pan to the boil, stirring all the time, add the chopped vegetables, and boil gently for 20 minutes. Shut off the steam, add the acid, stir well, and allow to cool before filling.

World copyright in this feature is fully reserved. No extracts without permission.



These particulars of New Patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The "Official Journal of Patents" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications

32324. Bayerische Milchversorgung Ges.: Production of animal fodder. November 25. (Germany, December 12, 1935.)
32367. Leonard, F.: Process for drying, etc., yeast. November 26.
32752. Neumann, A. J. (Bognar): Conservation of flour, etc. November 30.
32918. Piqué, J. J.: Storage of fruit. December 1.
33411. Canned Cream and Milk Co. Aktieselskab and Henriksen, P. K.: Milk products. December 5.
33641. Brooks, S.: Manufacture of bread. December 8.
33680. Burgess, A. F. (Long Co.): Conditioning bakery products. December 5.
33822 and 33823. Jefferies, W., and Peirce, Leslie and Co., Ltd.: Extraction of cashew nut-shell oil. December 9.
33905. Allan, E.: Curd-stirring machines. December 10.
34203. Brake, A.: Insulated vessel for raising the temperature of butter. December 12.
34851. Kellogg Co.: Treating cereal grains. December 18.
34959. McCaleb, A. G.: Celery salt. December 19. (United States, January 24.)
35314. Freund, E.: Preparing dietetic foods. December 23.
35609. Chemische Forschungsges: Artificial skins for sausages. December 29.
35776. Brandt, C.: Preparation of foodstuffs made from dough. December 30. (Germany, November 19.)
35854. U.S. Vitamin Corporation: Compositions of matter containing mixtures of mineral and vitamin components, etc. December 31. (United States, December 31, 1935.)
35884. Corn Products Co., Ltd. (Corn Products Refining Co.): Production of tablets of dextrose, etc. December 31.
437. Ward Baking Co.: Process and products for inhibition of mould. January 6. (United States, January 6, 1936.)

Complete Specifications Accepted

456,944. Stäger, A.: Process for producing a flavouring and seasoning preparation.
456,962. Bailey, J. S.: Beverages.
456,994. Kjorstad, E. A. H.: Preservation of food materials, particularly of fresh fish. (June 8, 1934.)
457,153. Lassen, W. O.: Apparatus for the evisceration of herrings and like fish.
457,349. Ito, Y.: Manufacture of liquorice extract.
457,603. Fairrie, J. L.: Treating oil-bearing edible materials.
457,698. Ges. für Linde's Eismaschinen Akt.-Ges. and Krause, G. A.: Process of manufacturing high quality beverage spirits.
457,717. Fitzpatrick, H. J. (Enkes, N. V.): Manufacture of ice-cream and similar comestible products, and apparatus therefore.
457,751. Spieker, E.: Manufacture of butter.
457,888. Robertson, T. A.: Method of preserving fruits and vegetables.
457,909. Borden Co.: Art of producing baked cereal products.
458,261. Cox, H. E.: Mills for mixing, grinding, refining, and other processes.
458,399. Soc. d'Études and Applications Industrielles: Manufacture of concentrated sweetened milk products and substances derived therefrom.
458,559. Boake, Roberts and Co., Ltd., A., and Revie, G. N.: Manufacture of cereal substances for use in the preparation of beverages.
458,581. Industrial Patents Corporation: Processes of improving shortening, and the improved shortening resulting therefrom (Addition to 413,343.)
458,582. Industrial Patents Corporation: Processes of improving shortening, and the improved shortening resulting therefrom. (Addition to 413,343.)
458,636. Chalifoux, A.: Locker for milk bottles, cream bottles, butter, or other provisions or articles.
458,703. Rockwood and Co.: Methods of preparing cocoa butter for shipment and transportation packages for use therewith.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

453,994. **Plucking poultry.** Grace, N. H., 214, Driveway, Ottawa, Canada.
In the plucking of poultry by the wax-coating method the dry, rough-plucked bird is cooled, or is allowed to cool, to a skin temperature between 90° and 70° F., preferably 80° F., and the depilatory material is applied, by dipping or spraying, at a temperature between 115° and 140° F., preferably 127° to 136° F. The depilatory material contains paraffin wax, rosin, and preferably a fat such as lard, and it may contain gum damar, candelilla wax, or rubber. Examples of suitable proportions of the ingredients are given, in all of which the amount of paraffin wax is over 45 per cent.
According to the specification as open to inspection under Sect. 91, a soft scald at a temperature of 129° F. may be included in the process. The subject-matter does not appear in the specification as accepted.

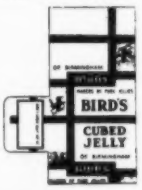
454,504. **Modified pectin product.** California Fruit Growers' Exchange, 607, South Hill Street, Los Angeles, California, U.S.A.
Pectin is treated with an acid, together with a liquid medium which is not a solvent or dispersing agent for pectin, to alter, and generally retard, the setting time. The acid may be gaseous (HCl, H_2S, SO_2, etc.) or in solution, hydrochloric acid being preferred, though organic acids—*e.g.*, lactic acid—may be used. The liquid medium required is an organic liquid, preferably containing a methyl or acetyl radicle, or saturated alkyl group. With absolute methyl alcohol, treatment of pectin causes acceleration of the setting time, but with 80 per cent. CH_3OH and most other liquids the time is retarded. The presence of much water is undesirable, as the pectin becomes difficult to handle owing to imbibition effects. Examples of the results attained are: On treatment of 20 gm. or dry pectin with 100 c.c. of organic liquid (concentration given in brackets) with addition of 10 c.c. of 10-N. HCl solution for 24 hours at 25° C., the setting time, originally 1·66 minutes, became: CH_3OH (80 per cent), 2·5 min.; C_2H_5OH (80 per cent.), 8 min.; isopropyl alcohol (90 per cent.), 13 min.; $CH_3COC_2H_5$ (100 per cent.), 25 min.; acetone (100 per cent.), 32 min. Retarded pectin may be accelerated by further treatment with 100 per cent. methyl alcohol and acid. *Cf.* E.P. 453,877. (Convention date, U.S.A., April 10, 1934.)

454,528. **Continuous extraction of vitamins.** A. Nyrop, 86, Tagensvej, Copenhagen, Denmark.
It has been found that the vitamin content of oils extracted from suitable material is greatly increased by a short (3 to 5 minutes') treatment at a temperature above 100° C. and under pressure, in the absence of air. For example, pulped cod liver or whale liver (the latter preferably with addition of a solvent) is heated at 115° C. under 1·8 atmospheres pressure for 3 minutes without access of air. Whereas a cold-extracted cod liver oil had 4,200 A units of vitamin A, the oil obtained after this treatment had 26,600 units. Apparatus for continuous treatment of material is outlined, steam being blown into a heating chamber into which the material is fed by a screw-expeller; the material is afterwards passed through a pressure-reducing device and separated into its components—for example, by centrifuging. The residue can be re-extracted for lower value oils.

LATEST TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

BIRD'S CUBED JELLY.—572,223. **Preparations for making edible jellies.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham, 12, Warwickshire. (Associated.) January 6.



BIRD'S JELLY CRYSTALS.—572,225. **Preparations in crystal form for making table jellies.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham, 12. (Associated.) January 6.

Registration of this trade mark shall give no right to the exclusive use of the device of a jelly.

BIRD'S TEA CAKE MIXTURE. — 572,229. **Tea cake mixture.** ALFRED BIRD AND SONS, LTD., Devonshire Works, High Street, Deritend, Birmingham, 12. (Associated.) January 6.

Registration of this trade mark shall give no right to the exclusive use of the device of cakes.

CHAJAS.—573,430. **Fruits and vegetables for food.** CHARLES JAMES SMITH, trading as Chas. J. Smith, Russell Street Enclosure, Covent Garden Market, London, W.C. 2.

FIVE DAY.—570,736. **Wafer biscuits and wafer biscuit confectionery.** FACCHINO'S PURITY BISCUITS, LTD., Purity Works, Old Bromford Lane, Ward End, Birmingham, 8. January 6.

INDU KANDE.—573,218. **Tea, coffee, cocoa, chocolate (beverage), and chicory.** JOSEPH TETLEY AND CO., LTD., 49, Mansell Street, London, E. 1. (Associated.) January 6.

KEMPAC.—570,830. **Infants' and invalids' foods, baking powder, and olive oil (for food).** KEMPAC, LTD., Clarence Hall, Bradford Road, Batley. (Associated.) December 23.

KRAFTSHIRE. — 572,771. **Cheese and cheese products (for food).** KRAFT CHEESE CO., LTD., Silverdale Road, Hayes, Middlesex. (Associated.) December 23.

MERRY GO. — 573,544. **Biscuits.** A. ROMARY AND CO., LTD., 26, Church Road, Tunbridge Wells, Kent. January 6.

OBAX. — 572,724. **Cooked meats and sausages.** H. READ, LTD., Prospex Works, 71, Rigby Street, Higher Broughton, Salford, 7. (Associated.) (By Consent.) December 30.

Registration of this trade mark shall give no right to the exclusive use of the device of sausages on a plate.

OLYMPIC.—572,773. **Salmon.** BALFOUR, GUTHRIE AND CO., LTD., 351, California Street, San Francisco, California, United States of America. (Associated.) December 16.

Registration of this trade mark shall give no right to the exclusive use of the device of a salmon cutlet.

PLEASING.—572,648. **Canned pineapple.** UNITED MALAYAN PINEAPPLE GROWERS AND CANNERS, LTD., 61, Chulia Street, Singapore, Straits Settlements.

Registration of this trade mark shall give no right to the exclusive use, either separately or in combination, of the word "Pleasing", the letter "P", and the devices of a pineapple and pineapple.

Registration No. 550,761 (2935) will be cancelled if and before the applicants' mark is registered.

PRIMULA.—572,954. **Cheese.** O KAVLI AKTIESELSKAP, Damsgaardsveien 59, Bergen, Norway. (Associated.) January 6.

SAN MARTIN. — B 570,638. **Tunny fish, sardines, anchovies, shrimps, and fish paste.** MARTINHO RICARDO FREDERICO STICHANER LACASTA, trading as M. M. Stichaner, Junr., 40, Great Tower Street, London, E.C. 3. (By Consent.) December 30.

User claimed from April 1, 1930.

The applicant undertakes that this mark, when registered, and the mark No. B 534,358 (2847), shall be assigned or transmitted only as a whole and not separately.

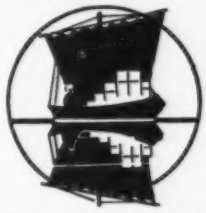
SAUSBIND. — 573,233. **A preparation composed of cereals, for use as a binding in sausages.** THOMAS ALBERT HOWE, 82, Farnan Avenue, Walthamstow, London, E. 17.

SUNFED.—572,109. **Flaked cereals for use as food.** LATHAM AND CO., LTD., Cakeoma Factory, Silverdale Avenue, Tuebrook, Liverpool. December 23.

TRAFEX.—572,570. **Edible oils and edible fats.** THOMAS HEDLEY AND CO., LTD., Phœnix Buildings, Collingwood Street, Newcastle-on-Tyne. December 30.

VALDA.—573,068. **Stoned raisins, cleaned currants, mixed fruit, and cleaned sultanas, all being dried fruit.** H.W. GARROD AND CO., LTD., Produce Exchange Building, Victoria Street, Liverpool. (Associated.) December 23.

452,471.—**Chocolate covered dates.** ALFRED CHANNON FINCKEN and BURLEIGH WILSON FINCKEN, trading as A. C. Fincken and Co., 197, Great Portland Street, London, W. 1. December 23.



B 561,768.—**A food preparation of chicken in cube form for use in making chicken broth.** HARRY PECK AND CO., LTD., 8, Devonshire Grove, London, S.E. 15. December 23.

User claimed from July 24, 1933.

567,839.—**Substances used as food or as ingredients in food.** MAISON AMIEUX-FRÈRES, 25, rue Chevreul, Nantes-Chantenay, Loire-Inférieure, France. November 18.

570,693.—**Meal, flour, and bread.** HINDHAUGHS, LTD., 38, Cloth Market, Newcastle-on-Tyne, 1. (By Consent.) December 2.

571,940.—**Substances used as food or as ingredients in food.** PHILLIPS YEAST PRODUCTS, LTD., Park Royal Road, London, N.W. 10. (Associated.) December 2.

NEW COMPANIES

Albrectsen, A., Limited. (322,402.) Registered December 29, 1936. 69, Hanging Ditch, Manchester, 4. To carry on the bus. of importers and exporters, margarine, butter and cheese factors, etc. Nom. Cap.: £10,000. Dirs.: A. E. Albrectsen, Riverside, Ashley Heath, Hale (permt. gov. dir. and ch.); Dora Albrectsen, Riverside, Ashley Heath, Hale.

Atomised Food Products, Limited. (322,089.) Abford House, 15, Wilton Road, S.W. 1. To take over the bus. of a mnfr. of and dlr. in coffee powders and other food substances cd. on by L. de Leopold. Nom. Cap.: £35,000. Dirs.: Sir Maurice Bonham Carter, K.C.B., K.C.V.O., 40, Gloucester Square, W. 2; Hon. P. M. Samuel, 1, Carlton Gardens, S.W. 1; J. F. Braithwaite, Sheredes, Cook Lane, Hoddesdon; O. B. S. Poole, The Vicarage, Lighthorne, Warwick; L. de Leopold, 142, Abbey Road, N.W. 6; R. W. Kershaw, A.C.I.S., 21, Upper Park Fields, S.W. 15.

Builders Copper Tube Company, Limited. (321,065.) 14, Norfolk Street, W.C. 2. To carry on the bus. of dlrs. in, mchts., and mnfrs. of lighting, heating, and refrigerating apparatus, etc. Nom. Cap.: £100. Permt. gov. dir.: C. E. T. O'Kill, Headingley, Old Claygate Lane, Esher, Surrey.

Cambridgeshire Fruit Juice Company, Limited. (320,481.) Llanaff Chambers, Regent Street, Cambridge. To carry on the bus. of mnfrs. of fruit and vegetable juices, etc. Nom. Cap.: £500. Permt. dirs.: H. A. Harvey, Harborough House, Harston, Cambs.; H. M. Freund, 21, Ponds Lane, Hampstead, N.W. 3, and 103, Kingsway, W.C. 2.

Coronest Milling Company, Limited. (321,782.) Coronest Mills, Knottingley, Yorks. To carry on the bus. of mnfrs. and producers of food products, etc. Nom. Cap.: £1,000. Dirs.: A. W. Remmer, 24, Spring Gardens, Lightcliffe Road, Brighouse, Yorks (permt. mang. dir.); Nellie W. Remmer, 24, Spring Gardens, Lightcliffe Road, Brighouse, Yorks.

Godwin Bakeries, Limited. (320,801.) Registered November 18, 1936. 18, Old Montague Street, E. 1. To carry on the bus. of wholesale mnfg. bakers, etc. Nom. Cap.: £1,500. Dirs.: M. M. Godinski, 42, Commercial Road, E. 1; F. Zway, 2, Clive Lodge, Brent Cross, N.W. 4. Remun. of dirs.: As voted by the co.

Grade Products, Limited. (320,802.) Registered November 18, 1936. 5 and 6, Bucklersbury, E.C. 4. To carry on bus. as mnfrs. of and dlrs. in foodstuffs, etc. Nom. Cap.: £2,000. Prov. dirs.: W. T. Robins, 119, Harland Avenue, Sidcup; H. C. Wells, Tamora, 83, Thurlestone Road, S.E. 27.

Holt, John W. (Mineral Waters), Limited. (320,910.) 34/6, Oxford Street, W. 1. To take over the bus. of a mineral water mnfr. cd. on by J. W. Holt at 2, Holmsdale Road, Foleshill, Coventry. Nom. Cap.: £6,000. Dirs.: J. W. Holt, 2, Holmsdale Road, Foleshill, Coventry; C. H. E. Stock, 1, Laburnum Avenue, Radford, Coventry.

Honeywell-Brown, Limited. (320,495.) To carry on the bus. of mnfrs. of and dlrs. in thermostats, humidity and temperature controls, etc. Nom. Cap.: £10,000. Permt. gov. dir. and ch.: H. W. Sweatt, address not stated. Subs.: R. M. Buller, St. Andrews, Weybridge, Surrey (solr.); G. D. Naylor, 3, Hyde Park Place, W. 2 (solr.).

Jacksons (Salford), Limited. (321,001.) 90, Deansgate, Manchester. To carry on the bus. of biscuit mnfrs., restaurant and tea-room proprs., etc. Nom. Cap.: £1,000. F. D. Webb, of 90, Deansgate, Manchester, signs as dir.

Kimberley Home-Made Jams, Limited. (320,601.) Registered Novembef 12, 1936. Kimberley, St. Ann's Chapel, Gunnislake, Cornwall. To take over the bus. of jam makers cd. on by F. N. and Hilda Warren at Gunnislake, Cornwall. Nom. Cap.: £1,500. Dirs.: F. H. Warren, Kimberley, St. Ann's Chapel, Gunnislake, Cornwall; Hilda Warren, ditto.

Liebig's (Kenya), Limited. (321,133.) To carry on the bus. of food specialists, etc., in Kenya and elsewhere. Nom. Cap.: £100,000 in £1 shares. Dirs.: To be appointed by the subs. Qual. of dirs.: £100. Remun. of dirs.: As voted by the co. Subs.: G. P. Smith, 4, South View, Bromley, Kent; S. B. Robertson, 17, Willow Way, Finchley, N. (accnt.).

Nathan's Sales, Ltd. (319,886.) To take over the bus. of the milk powder, casein, and dairy machinery department of Joseph Nathan and Co., Ltd., at 28-32, Chiswell Street, E.C. Nom. Cap.: £50,000. Dirs.: A. Nathan, 16, St. Helen's Place, E.C. 3; S. Jacobs, ditto; W. H. Cummings, address not stated.

Noakes Foils, Limited. (320,413.) 4, Dorchester Parade, Leigham Court Road, Streatham, S.W. To carry on bus. as mnfrs. of aluminium, tin, and other metals, foil sheet, wrappings, packings, etc. Nom. Cap.: £20,000. Dirs.: R. S. A. Noakes, 40, Pendennis Road, S.W. 16 (life dir.); J. F. T. Noakes, 40, Ferndene Road, S.E. 24 (life dir.); J. W. Organ, Whitehall Hotel, Bloomsbury Square, W.C. 1 (mng. dir.).

Refrigeration (Birmingham), Limited. (321,011.) 210, Broad Street, Birmingham. To carry on the bus. of mnfrs. of and dlrs. in refrigerators, etc. Nom. Cap.: £6,000 in £1 shares (4,000 redeemable pref. and 2,000 ord.). Permt. gov. dirs.: H. Gardner, 50, St. Agnes Road, Moseley, Birmingham; A. M. Allan, 132, Grove Road, King's Heath, Birmingham. Qual. of gov. dirs.: 1,000 fully paid shares.

R. G. Foods (Derby), Limited. (319,932.) To acquire the premises, plant, and machinery belonging to the bus. of R. G. Foods Co., and a licence to mnfr. and sell dried agricultural and horticultural crops, foodstuffs, etc. Nom. Cap.: £30,000. Subs.: Col. R. F. Ratcliff, C.M.G., Trewton Park, Burton-on-Trent; C. Goodall, Hoon Hay, Hatton, Derby.

Superbe Cheese Company, Limited. (320,697.) Registered November 14, 1936. To take over the bus. cd. on at 24, Howland Street, London, as "Thurston Darby and Co." and to carry on the bus. of importers, exporters, mchts. and vendors of dairy and farm produce, etc. Nom. Cap.: £1,000. Dirs.: To be appointed by the subs. Subs.: L. Gedge, 7, St. James Street, W.C. 1 (solr.); H. A. Douglas, 130, Braidwood Road, S.E. 6 (clk.).

Toomey, D. P., and Company, Limited. (320,855.) Registered November 19, 1936. 60, Middle Street, Brighton, Sussex. To carry on the bus. of refrigerating and air conditioning experts, etc. Nom. Cap.: £5,000. Permt. dirs.: D. P. Toomey, 14b, Fourth Avenue, Hove (ch.); J. H. P. Dalton, 23, Ethelbert Road, Canterbury; E. A. J. Soulby, 24, Court Road, Tunbridge Wells.

Tuckwell Food Products, Limited. (320,889.) Registered November 19, 1936. Finsbury Court, Finsbury Pavement, E.C. 2. To carry on the bus. of importers, exporters, and mnfrs. of and dlrs. in foods, preserves, pickles, etc. Nom. Cap.: £100. Permt. dirs.: H. A. Nabi, 32, Elsham Road, W. 14; Joan M. Tucker, 59, Kenilworth Court, S.W. 15.

Vigro Products, Limited. (320,265.) To carry on the bus. of mnfrs. of and dlrs. in cereal foods, provisions, and foodstuffs, etc., and to acquire a trade mark together with the whole of the goodwill of the business connected therewith. Nom. Cap.: £2,000. Dirs.: S. C. Hancock, 15, Tudor Drive, Watford; Mrs. V. L. M. Hancock, ditto.

Viviane, Limited. (320,266.) 144a, Marylebone Road, N.W. 1. To carry on bus. as mnfrs. of and dlrs. in chocolates, sweets, etc. Nom. Cap.: £1,000. Dirs.: Dorothy Hockney, 44, Penywern Road, S.W. 5; R. de Fortemps de Loneux, 41, Rue des Peres Blancs, Brussels; A. de Cuvelier Bart, 72, Avenue Louis Le Poutre, Brussels; G. L. Couch, Tudor House, Eastcote Road, Ruislip, Middlesex.

Winsome Dairy Products, Limited. (319,736.) To take over the bus. cd. on by the Process Cheese Department of Joseph Nathan & Co., Ltd., at 42a, Bravington Road, London. Nom. Cap.: £20,000. Dirs.: A. Nathan, 16, St. Helen's Place, E.C. 3; A. Sandercock, 18, King Street, West Smithfield, E.C. 1; H. Wolff, address not stated; H. C. Freeth, address not stated.

Wright's Biscuits, Limited. (320,011.) Wright's Biscuit Factory, Rutland Street, South Shields. To acquire the whole or part of the undertaking of L. Wright and Son (1933), Ltd.; to carry on the bus. of biscuit mnfrs. and dlrs., etc. Nom. Cap.: £2,500. Dirs.: F. Cross, Ribblesdale, Meadowfield Road, Stocksfield; W. P. Webster, Sunny West, Two Ball Lonnen, Newcastle-on-Tyne.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.